PSYCHE

A JOURNAL OF ENTOMOLOGY

ESTABLISHED IN 1874

VOL. XXXIX DECEMBER, 1932 No. 4

TABLE OF CONTENTS

Entomological Publications of C. W. Johnson. *A. L. Melander*.. 87
Notes on Some American Tingitidæ (Hemiptera). *Carl J. Drake* 100
Oviposition of the Ichneumonid *Itoplectis conquisitor* (Say) in a Larva of *Pyrausta nubilalis* Hübn. *Milton F. Crowell*.... 102
Concerning the Genus Notiobiella (Neuropt.-Hemerobiidæ). *Nathan Banks*.......... 103
Some Miscellaneous Gerridæ in the Collection of the Museum of Comparative Zoology (Hemiptera). *C. J. Drake* and *H. M. Harris*.......... 107
Notes on the Genus Dysdercus (Hemiptera-Heteroptera) in Trinidad, B. W. I. *Eric O. Pearson*.......... 113
Local Distribution of *Formica ulkei* Mound-nests with Reference to Certain Ecological Factors. *W. A. Dreyer* and *Thos. Park*.......... 127
Phoridæ Associated with Ants and Termites in Trinidad. *C. T. Brues*.......... 134
Notes on Some Tropical Phoridæ. *C. T. Brues*.......... 139
Note on *Haplodictyus incertus* Navas. *F. M. Carpenter*........ 144
The Effect of Temperature and Relative Humidity upon the Olfactory Responses of Blowflies. *Cyril E. Abbott*......... 145
Notes on the Prey and Inquilines of *Podalonia violaceipennis* form *luctuosa* (F. Smith). *Charles H. Hicks*............ 150
Index to Volume XXXIX.......... 157

CAMBRIDGE ENTOMOLOGICAL CLUB

OFFICERS FOR 1932

President	C. W. COLLINS
Vice-President	P. J. DARLINGTON
Secretary	J. W. JOHNSTON
Treasurer	F. H. WALKER
Executive Committee	J. BEQUAERT F. M. CARPENTER S. M. DOHANIAN

EDITORIAL BOARD OF PSYCHE

EDITOR-IN-CHIEF

C. T. BRUES, HARVARD UNIVERSITY

ASSOCIATE EDITOR

F. M. CARPENTER

CONSULTING EDITORS

NATHAN BANKS,
Harvard University.

THOMAS BARBOUR,
Harvard University.

A. E. EMERSON,
University of Chicago.

A. L. MELANDER,
College of the
City of New York.

A. P. MORSE,
Peabody Museum,
Salem, Mass.

J. G. NEEDHAM,
Cornell University.

W. M. WHEELER,
Harvard University.

PSYCHE is published quarterly, the issues appearing in March, June, September, and December. Subscription price, per year, payable in advance: $2.00 to Subscribers in the United States; foreign postage, 25 cents extra, Canada 15 cents. Single copies, 65 cents.

Cheques and remittances should be addressed to Treasurer, Cambridge Entomological Club, Museum of Comparative Zoology, Cambridge, Mass.

Orders for back volumes, missing numbers, notices of change of address, etc., should be sent to F. M. Carpenter, Museum of Comparative Zoology, Cambridge, Mass.

IMPORTANT NOTICE TO CONTRIBUTORS

Manuscripts intended for publication, books intended for review, and other editorial mattter, should be addressed to Professor C. T. Brues, Institute of Biology, Harvard University, Cambridge, Mass.

Authors contributing articles over 8 printed pages in length will be required to bear a part of the extra expense, for additional pages. This expense will be that of typesetting only, which is about $2.00 per page. The actual cost of preparing cuts for all illustrations must be borne by contributors; the expense for full page plates from line drawings is approximately $5.00 each, and for full page half-tones, $7.50 each; smaller sizes in proportion.

AUTHOR'S SEPARATES

Reprints of articles may be secured by authors, if they are ordered before, or at the time proofs are received for corrections. The cost of these will be furnished by the Editor on application.

Entered as second-class mail matter at the Post Office at Boston, Mass. Acceptance for mailing at special rate of postage provided in Section 1103, Act of October 3, 1917, authorized on June 29, 1918.

Printed by the Eliot Press, Jamaica Plain, Mass., U.S.A.

PSYCHE

VOL. XXXIX DECEMBER, 1932 No. 4

THE ENTOMOLOGICAL PUBLICATIONS OF C. W. JOHNSON

BY A. L. MELANDER

College of the City of New York, New York, N. Y.

In presenting the following list of the entomological writings of the late Charles Willison Johnson, I sincerely hope that no important titles have been omitted. This list has been checked with the libraries of J. M. Aldrich, C. T. Brues and myself, the Zoological Record, Biological Abstracts and several bibliographical references. Finally Mr. Richard Dow has compared it with the collection of reprints in the Boston Society of Natural History, verified the dates of publication and added many missing titles.

In addition to the cited titles, Mr. Johnson issued numerous brief notices in the Bulletins of the Boston Society of Natural History. Only the more important of these are included, but an Index to Bulletins 1-50 was issued in October, 1931.

A biographical account of Mr. Johnson has been given by W. Sprague Brooks in Bulletin 65 of the Boston Society of Natural History, October, 1932.

As a fellow dipterist I wish to record my sorrow in the passing of Johnson and my appreciation of having shared his friendship. In the formative days of my career his generosity in furnishing determined specimens gave that stimulus helpful to the beginner. A few days ago I had occasion to study some specimens of the Johnson collection now located at the Harvard museum. The methodical arrangement of his insects, his neatly written labels and the suggestions of many collecting trips given by the locality labels make it hard to comprehend that this collection has been completed and that the mind and the hand of the curator are forever stilled.

1893

Puparium of *Ceria signifera.* Ent. News, vol. 4, p. 91 (1893).

1894

List of the Diptera of Jamaica with descriptions of new species. Proc. Acad. Nat. Sci. Philadelphia for 1894, pp. 271-281 (1894).

1895

Diptera of Florida. With additional descriptions of new genera and species by D. W. Coquillett. Proc. Acad. Nat. Sci. Philadelphia for 1895, pp. 303-340 (1895).

A review of the Stratiomyia and Odontomyia of North America. Trans. American Ent. Soc., vol. 22, pp. 227-278, pls. 3-4 (1895).

1897

[A few notes on the distribution of Platypeza.] Ent. News, vol. 8, p. 254 (1897).

Some notes and descriptions of new Leptidæ. Ent. News, vol. 8, pp. 117-120 (1897).

1898

Notes and descriptions of new Syrphidæ from Mt. St. Elias, Alaska. Ent. News, vol. 9, pp. 17-18 (1898) [Mailed Dec. 1897].

Diptera collected by Dr. A. Donaldson Smith in Somaliland, eastern Africa. Proc. Acad. Nat. Sci. Philadelphia for 1898, pp. 157-164 (1898).

1900

Order Diptera. In *Insects of New Jersey* by J. B. Smith and others, Suppl. to 27th Annual Report State Board Agric., pp. 617-699 (1900).

Some notes and descriptions of seven new species and one new genus of Diptera. Ent. News, vol. 11, pp. 323-328 (1900).

New North American Ortalidæ. Canadian Ent., vol. 32, pp. 246-247 (1900).

1901

Variation in the venation of *Amalopis inconstans* Osten Sacken. Ent. News, vol. 12, pp. 305-307 (1901).

1902

On the validity of *Dasyllis affinis* Macquart. Ent. News, vol. 13, pp. 77-78 (1902).

Remarks on *Tephronota ruficeps* and description of a new species. Ent. News, vol. 13, pp. 143-144 (1902).

New North American Diptera. Canadian Ent., vol. 34, pp. 240-242 (1902).

1903

A new genus and four new species of Asilidæ. Psyche, vol. 10, pp. 111-114 (1903).

Some notes and descriptions of three new Leptidæ. Ent. News, vol. 14, pp. 22-26 (1903).

Two new species of the family Pipunculidæ. Ent. News, vol. 14, pp. 107-108 (1903).

[with D. W. Coquillett] Diptera of Beulah, New Mexico. Trans. American Ent. Soc., vol. 29, pp. 101-106 (1903).

Descriptions of three new Diptera of the genus Phthiria. Psyche, vol. 10, pp. 184-185 (1903) [Mailed Jan. 1904].

1904

Some notes, and descriptions of four new Diptera. Psyche, vol. 11, pp. 15-20 (1904).

When to collect Tabanidæ. Psyche, vol. 11, p. 35 (1904).

Some of the Diptera to be collected during April and May. Psyche, vol. 11, pp. 37-38 (1904).

Merope tuber. Psyche, vol. 11, p. 38 (1904).

Pelecinus polyturator Drury. Psyche, vol. 11, p. 38 (1904).

A revised list of the Diptera of Bermuda. Psyche, vol. 11, pp. 76-80 (1904).

A supplementary list of the Diptera of New Jersey. Ent. News, vol. 15, pp. 157-163 (1904).

1905

[Review of *Mosquitos or Culicidæ of New York State* by E. P. Felt.] Psyche, vol. 12, p. 26 (1905).

[Review of *Report of the New Jersey State Agricultural Experiment Station upon the mosquitoes occurring within the state, their habits, life history, etc.* by J. B. Smith.] Psyche, vol. 12, p. 50 (1905).

Synopsis of the tipulid genus Bittacomorpha. Psyche, vol. 12, pp. 75-76 (1905).

[Review of *A catalogue of North American Diptera* by J. M. Aldrich.] Psyche, vol. 12, pp. 77-78 (1905).

[Review of *May flies and midges of New York* by J. G. Needham, K. J. Morton, and O. A. Johannsen.] Psyche, vol. 12, p. 106 (1905).

[Review of *Wasps social and solitary* by G. W. and E. G. Peckham.] American Naturalist, vol. 39, pp. 602-603 (1905).

1906

Notes on some dipterous larvæ. Psyche, vol. 13, pp. 1-4, pl. 1 (1906).

Descriptions of two new Diptera of the family Dolichopodidæ. Psyche, vol. 13, pp. 59-60 (1906).

The distribution of the Periodical Cicada in New England in 1906. Psyche, vol. 13, p. 159 (1906).

Charles Robert v. d. Osten Sacken. Ent. News, vol. 17, pp. 273-275 (1906).

[Review of *American insects* by V. L. Kellogg.] American Naturalist, vol. 40, pp. 137-138 (1906).

1907

A new genus and species of the family Tachinidæ, parasitic on *Archips cerasivorana.* Psyche, vol. 14, pp. 9-10 (1907).

The Snow-fly, *Chionea valga* Harris. Psyche, vol. 14, pp. 41-43 (1907).

Some North American Syrphidæ. Psyche, vol. 14, pp. 75-80 (1907).

A review of the species of the genus Bombylius of the eastern United States. Psyche, vol. 14, pp. 95-100 (1907).

[Review of *Notes on Jamaican Hemiptera* by E. P. Van Duzee.] Psyche, vol. 14, p. 123 (1907) [Mailed Jan. 1908].

1908

[Review of *Mosquito life* by E. G. Mitchell.] Psyche, vol. 15, p. 3 (1908).

Notes on New England Bombyliidæ, with a description of a new species of Anthrax. Psyche, vol. 15, pp. 14-15 (1908).

A note on the distribution of *Bittacomorpha jonesi*. Psyche, vol. 15, p. 25 (1908).

A note on Calotarsa, and descriptions of two new species of Callimyia. Psyche, vol. 15, pp. 58-59 (1908).

The Screw Worm *(Chrysomyia macellaria)*. Psyche, vol. 15, p. 60 (1908).

The Diptera of the Bahamas, with notes and description of one new species. Psyche, vol. 15, pp. 69-80 (1908).

The distribution of *Blepharocera tenuipes* Walker. Psyche, vol. 15, p. 104 (1908).

1909

The importance of local ecological studies in entomology. Psyche, vol. 16, pp. 5-12 (1909).

Notes on the synonymy of the species of Erax of the eastern United States. Psyche, vol. 16, pp. 32-33 (1909).

Notes on the distribution of some Trypetidæ with description of a new species. Psyche, vol. 16, pp. 113-114 (1909).

The rediscovery of *Glutops singularis* Burgess. Psyche, vol. 16, p. 132 (1909).

New and little known Tipulidæ. Proc. Boston Soc. Nat. Hist., vol. 34, pp. 115-133, pls. 15-16 (1909).

The insects, excluding the beetles. In *Labrador, the country and the people* by W. T. Grenfell and others. New York, Macmillan Co., pp. 427-441, 2 pls. (1909).

1910

A revision of the species of Agathomyia of the eastern United States. Psyche, vol. 17, pp. 7-8 (1910).

A note on the species of Fucellia of eastern North America. Psyche, vol. 17, pp. 76-78 (1910).

Order Diptera. In *A report of the insects of New Jersey* by J. B. Smith and others, Annual Report New Jersey State Museum 1909, pp. 703-814 (1910).

Some additions to the dipteran fauna of New England. Psyche, vol. 17, pp. 228-235 (1910) [Mailed Jan. 1911].

1911

Notes on the dipterous genera proposed by Billberg in his *Enumeratio insectorum*. Psyche, vol. 18, pp. 73-74 (1911).

1912

New North American Diptera. Psyche, vol. 19, pp. 1-5 (1912).

Dipterological notes. Psyche, vol. 19, pp. 102-104 (1912).

The velutinous species of the genus Chrysopilus. Psyche, vol. 19, pp. 108-109 (1912).

New and interesting Diptera. Psyche, vol. 19, pp. 151-153 (1912).

The North American species of the genus Hæmatopota. Psyche, vol. 19, pp. 181-183 (1912) [Mailed Jan. 1913].

1913

Species of the genus Gaurax of the eastern United States. Psyche, vol. 20, pp. 34-35 (1913).

A study of the Clusiodidæ (Heteroneuridæ) of the eastern United States. Psyche, vol. 20, pp. 97-101 (1913).

Notes on variation in the venation of the species of the genus Leptogaster. Psyche, vol. 20, pp. 162-164 (1913).

Merope tuber in Massachusetts. Psyche, vol. 20, p. 170 (1913).

Mantispa interrupta Say in New England. Psyche, vol. 20, p. 170 (1913).

On the *Criorhina intersistens* Walker and an allied species. Ent. News, vol. 24, pp. 293-295 (1913).

The North American species of the genera Arthropeas and Arthroceras. Canadian Ent., vol. 45, pp. 9-12 (1913).

Insects of Florida. 1. Diptera. Bull. American Mus. Nat. Hist., vol. 32, pp. 37-90 (1913).

The dipteran fauna of Bermuda. Ann. Ent. Soc. America, vol. 6, pp. 443-452 (1913).

The distribution of some species of Drosophila. Psyche, vol. 20, pp. 202-205 (1913) [Mailed Jan. 1914].

1914

Some new and interesting species of Sapromyza. Psyche, vol. 21, pp. 20-23 and 82, pl. 3 (1914).

Anasa repetita Heidemann in Massachusetts. Psyche, vol. 21, p. 82 (1914).

The discovery of *Eclimus harrisi* in the White Mountains, N. H. Psyche, vol. 21, p. 123 (1914).

A new stratiomyid. Psyche, vol. 21, pp. 158-159 (1914).

Notes on inadequate locality labels. Ent. News, vol. 25, pp. 123-126 (1914).

1915

Two new species of Borboridæ. Psyche, vol. 22, pp. 21-22 (1915).

A new species of Pseudotephritis. Psyche, vol. 22, p. 49 (1915).

A fly preserved in paper. Psyche, vol. 22, p. 63 (1915).

A new species of the genus Nephrocerus. Canadian Ent., vol. 47, pp. 54-56 (1915).

The Collection of New England Insects. Bull. Boston Soc. Nat. Hist., no. 3, pp. 3-6 (1915).

Note on the species of the genus Acrocera. Psyche, vol. 22, pp. 198-203 (1915) [Mailed Jan. 1916].

1916

Further studies on the Platypezidæ. Psyche, vol. 23, pp. 27-33 (1916).

Some New England Syrphidæ. Psyche, vol. 23, pp. 75-80 (1916).

Parasites of *Archips cerasivorana* Fitch. Psyche, vol. 23, p. 81 (1916).

The *Volucella bombylans* group in America. Psyche, vol. 23, pp. 159-163 (1916) [Mailed Jan. 1917].

1917

A new maritime anthomyid. Canadian Ent., vol. 49, p. 148 (1917).

A new species of Criorhina from New England. Psyche, vol. 24, pp. 153-154 (1917).

Species of the genus Brachyopa of the eastern United States. Canadian Ent., vol. 49, pp. 360-362 (1917).

1918

Notes on the species of the genus Dioctria. Psyche, vol. 25, pp. 102-103 (1918).

Collecting in a museum. Bull. Boston Soc. Nat. Hist., no. 15, pp. 3-5 (1918).

A glance at the insects of Mt. Washington and Mount Desert. Sieur de Monts Publ., no. 18, pp. 22-25 (1918?).

1919

New species of the genus Villa *(Anthrax)*. Psyche, vol. 26, pp. 11-13 (1919).

The North American Diptera described by Nils S. Swederus. Canadian Ent., vol. 51, p. 32 (1919).

A revised list of the Diptera of Jamaica. Phoridæ by Charles T. Brues. Bull. American Mus. Nat. Hist., vol. 41, pp. 421-449 (1919).

Our insect friends. Bull. Boston Soc. Nat. Hist., no. 19, pp. 3-6 (1919).

On the variation of *Tabanus atratus* Fabricius. Psyche, vol. 26, pp. 163-165 (1919) [Mailed Jan. 1920].

A new species of the genus Ulidia. Psyche, vol. 26, pp. 165-166 (1919) [Mailed Jan. 1920].

1920

A revision of the species of the genus Loxocera, with a description of a new allied genus and a new species. Psyche, vol. 27, pp. 15-19 (1920).

Descriptions of some new tropical Pachygastrinæ. Psyche, vol. 27, pp. 112-115 (1920).

Variation of the Palm Weevil. Journ. of Heredity, vol. 11, pp. 84-85 (1920). Reprinted in The Guide to Nature, vol. 13, pp. 183-184 (1921).

The female of *Glutops singularis* Burgess. Psyche, vol. 27, pp. 153-154 (1920) [Mailed Feb. 1921].

1921

A new ptinid for New England. Psyche, vol. 28, p. 7 (1921).

Okanagana rimosa (Say) in Nova Scotia. Psyche, vol. 28, p. 15 (1921).

A review of the American species of the genus Palloptera. Psyche, vol. 28, pp. 20-23 (1921).

New Diptera from Texas and Mexico. Psyche, vol. 28, pp. 56-59 (1921).

New species of Diptera. Occ. Papers Boston Soc. Nat. Hist., vol. 5, pp. 11-17 (1921).

1922

Notes on distribution and habits of some of the bird-flies, Hippoboscidæ. Psyche, vol. 29, pp. 79-85 (1922).

New genera and species of Diptera. Occ. Papers Boston Soc. Nat. Hist., vol. 5, pp. 21-26 (1922).

Muscina pascuorum Meigen in New England. Science, n. s. vol. 56, p. 604 (1922).

1923

The occurrence of *Muscina pascuorum* Meigen in North America in 1922. Psyche, vol. 30, pp. 1-5 (1923).

New species of North American Cyrtidæ. Psyche, vol. 30, pp. 49-51 (1923).

A review of the Platypezidæ of eastern North America. Occ. Papers Boston Soc. Nat. Hist., vol. 5, pp. 51-58, pl. 5 (1923).

New and interesting species of Diptera. Occ. Papers Boston Soc. Nat. Hist., vol. 5, pp. 69-72 (1923).

Collecting Diptera in Maine. The Maine Naturalist, vol. 3, pp. 7-10 (1923).

The Society's insect collection. Bull. Boston Soc. Nat. Hist., no. 31, pp. 3-4 (1923).

The Periodical Cicada. Bull. Boston Soc. Nat. Hist., no. 31, p. 4 (1923).

Notes on the nests of *Odynerus (Ancistrocerus) bireni-maculatus* Saussure. Psyche, vol. 30, pp. 226-227 (1923) [Mailed Jan. 1924].

1924

Notes on *Muscina pascuorum* Meigen during 1923. Psyche, vol. 31, pp. 17-18 (1924).

A review of the New England species of Chrysotoxum. Occ. Papers Boston Soc. Nat. Hist., vol. 5, pp. 97-100 (1924).

Diptera of the Williams Galapagos Expedition. Zoologica (New York Zool. Soc.), vol. 5, pp. 85-92 (1924).

1925

A new species of the genus Gaurax. Psyche, vol. 32, p. 47 (1925).

The North American varieties of *Volucella bombylans* Linn. Psyche, vol. 32, pp. 114-117 (1925).

New species of Diptera from North Carolina and Florida. Psyche, vol. 32; pp. 299-302 (1925).

Diptera of the Harris Collection. Proc. Boston Soc. Nat. Hist., vol. 38, pp. 57-99 (1925).

Fauna of New England. 15. List of the Diptera or two-winged flies. Occ. Papers Boston Soc. Nat. Hist., vol. 7, no. 15, pp. 1-326 (1925).

Insects that infest birds. Bull. Northeastern Bird-banding Assoc., vol. 1, pp. 51 [bis]-53 (1925).

Mantispa interrupta and *M. brunnea* in New England. Psyche, vol. 32, p. 318 (1925) [Mailed Jan. 1926].

[Note on *Aellopos titans* Cram.] Psyche, vol. 32, p. 318 (1925) [Mailed Jan. 1926].

1926

The distribution of *Muscina pascuorum* Meigen in America. Psyche, vol. 33, pp. 20-21 (1926).

The synonymy of *Actina viridis* (Say). Psyche, vol. 33, pp. 88-90 (1926).

A note on *Beris annulifera* (Bigot). Psyche, vol. 33, pp. 108-109 (1926).

A revision of some of the North American species of Mydaidæ. Proc. Boston Soc. Nat. Hist., vol. 38, pp. 131-145, pl. 3 (1926).

[with others] Concerning Townsend's *Inside history of North American myiology.* Journ. New York Ent. Soc., vol. 34, pp. 69-70 (1926).

1927

Dipterological notes. Psyche, vol. 34, pp. 33-35 (1927).

New species of Scatophagidæ. Psyche, vol. 34, pp. 100-103 (1927).

Notes on the present distribution of two introduced moths. Psyche, vol. 34, pp. 176-177 (1927).

Some remarks on questionable types. Proc. Ent. Soc. Washington, vol. 29, pp. 45-46 (1927).

The infestation of Bluebirds' nests by Protocalliphora. Bull. Northeastern Bird-banding Assoc., vol. 3, pp. 1-3 (1927).

Further studies of Protocalliphora infesting nestling birds. Bull. Northeastern Bird-banding Assoc., vol. 3, pp. 77-82 (1927).

Biological survey of the Mount Desert Region. Part 1. The insect fauna with reference to the flora and other biological features. 248 pp. Philadelphia, Wistar Institute of Anatomy and Biology (1927).

[Review of *The natural history of ants* by R. A. F. de Réaumur, translated and annotated by W. M. Wheeler.] Bull. Boston Soc. Nat. Hist., no. 42, pp. 10-11 (1927).

The Clark Collection of Lepidoptera. Bull. Boston Soc. Nat. Hist., no. 45, pp. 5-6 (1927). Reprinted in Ent. News, vol. 39, pp. 23-24 (1928).

[with others] Report of Committee on National Museum. Ann. Ent. Soc. America, vol. 20, pp. 140-148 (1927).

The *Tricyphona inconstans* on Nantucket Island, Mass. Psyche, vol. 34, pp. 216-217 (1927) [Mailed Jan. 1928].

1928

The Periodical Cicada in New England. Bull. Boston Soc. Nat. Hist., no. 47, pp. 3-6 (1928).

The New England Siricidæ or horntails. Bull. Boston Soc. Nat. Hist., no. 49, pp. 3-7 (1928).

Some common insects of the household. (Natural history by radio.) Scientific Monthly, vol. 27, pp. 343-346 (1928).

A new cecidomyiid of the genus Lestodiplosis. Psyche, vol. 35, p. 216 (1928) [Mailed Feb. 1929].

1929

A flight of *Pieris monuste*. Psyche, vol. 36, p. 92 (1929).

Diptera destroying snails. Psyche, vol. 36, p. 106 (1929).

A new species of Blepharocera from Massachusetts. Psyche, vol. 36, pp. 123-124 (1929).

Diptera of Labrador. Psyche, vol. 36, pp. 129-146 (1929).

A note on *Chilosia hiawatha* Shannon. Psyche, vol. 36, pp. 237-238 (1929).

The injury to nestling birds by the larvæ of Protocalliphora. Ann. Ent. Soc. America, vol. 22, pp. 131-135 (1929).

Some additional notes on Protocalliphora. Bull. Northeastern Bird-banding Assoc., vol. 5, pp. 29-30 (1929).

Some notes on certain of the hippoboscid flies. Bull. Northeastern Bird-banding Assoc., vol. 5, pp. 49-52 (1929).

Nantucket as a collecting ground. Bull. Boston Soc. Nat. Hist., no. 50, pp. 3-6 (1929).

Notes on parasitic Hymenoptera. Bull. Boston Soc. Nat. Hist., no. 51, pp. 8-9 (1929).

Notes on the Syrphidæ collected at Jaffrey and Mount Monadnock, N. H., with a description of a new species. Psyche, vol. 36, pp. 370-375 (1929) [Mailed Jan. 1930].

1930

On the variation and abundance of *Sirex nitidus* Harris. Psyche, vol. 37, pp. 281-282 (1930).

A bot fly of the White-footed Mouse. Psyche, vol. 37, pp. 283-284 (1930).

The walking-stick, *Monomera blatchleyi* race *atlantica* Davis in eastern Massachusetts. Psyche, vol. 37, p. 285 (1930).

Louis William Swett [obituary]. Psyche, vol. 37, pp. 300-301 (1930).

Some notes on mosquitoes. Bull. Boston Soc. Nat. Hist., no. 55, pp. 16-20 (1930).

Notes on Protocalliphora during the summer of 1930. Bird-banding, vol. 1, pp. 169-173 (1930).

A list of the insect fauna of Nantucket, Massachusetts. With a list of the spiders by James H. Emerton. Publ. of the Nantucket Maria Mitchell Assoc., vol. 3, no. 2, pp. 1-176, i-xviii (1930).

1931

Two new species of fungus gnats of the genus Apemon. Psyche, vol. 38, pp. 22-24 (1931).

An interesting copy of Wiedemann's *Diptera exotica*. Psyche, vol. 38, pp. 25-26 (1931).

James Henry Emerton [obituary]. Bull. Boston Soc. Nat. Hist., no. 58, pp. 21-22 (1931).

Nestling birds destroyed by the larvæ of Protocalliphora. Bull. Boston Soc. Nat. Hist., no. 59, pp. 21-24 (1931).

[Review of *Thomas Say, early American naturalist* by H. B. Weiss and G. M. Ziegler.] Bull. Boston Soc. Nat. Hist., no. 60, pp. 23-24 (1931).

1932

Notes on Protocalliphora during the summer of 1931. Bird-banding, vol. 3, pp. 26-29 (1932).

Reginald Heber Howe [obituary]. Bull. Boston Soc. Nat. Hist., no. 63, pp. 29-30 (1932).

A new species of the genus Mydas. Psyche, vol. 39, p. 72 (1932).

NOTES ON SOME AMERICAN TINGITIDAE (HEMIPTERA)

Carl J. Drake,

Ames, Iowa

The present paper is based almost entirely upon a small collection of American Tingitidæ kindly loaned to the writer by Nathan Banks of the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts. In addition to *Corythucha decepta,* described below as new, this collection is represented by *Monanthia monotropidia* Stäl, Gamboa, Canal Zone, July 9, 1924, collected by Nathan Banks; *Teleonemia prolixa* Stàl, Barro Colorado, July 23, 1924, N. Banks; *Teleonemia albomarginata* Champion, Barro Colorado, Canal Zone, July 19, 1924, and Rio Frio, Mgd., Colombia, P. J. Darlington; *Teleonemia sacchari* Fabr., Bella Vista, Panama, July 7, 1924, N. Banks; *Acalypta ovata* Osborn and Drake; Smoky Mts., N. C.—Tenn., Newfound Gap, Elevation 5,000—5,200 ft., collected in moss by Nathan Banks; *Acanthocheila armigera* Stäl, Bella Vista, Canal Zone, July 7, 1924, N. Banks; *Gargaphia nigrinervis* Stäl, Rio Frio, Colombia, May 15, P. J. Darlington; *Corythaica planaris* Stäl, Red Tank, Canal Zone, N. Banks; *Corythucha padi* Drake, Hood River, Oregon, Sept. 5, 1917, F. R. Cole; *Corythucha obliqua* Osborn and Drake, Carmel, Cal., June 22, 1918, C. L. Hubbs; *Corythucha spinosa* Duges. The writer is indebted to Mr. A. A. Nichol for the specimens of *Corythucha sagillata,* n. sp., from Arizona.

Corythucha decepta, n. sp.

Moderately large, testaceous, the pronotum and a more or less distinct band near the base of the elytra brown. Hood long, much smaller and placed a little farther for-ward on the pronotum than in either *C. setosa* Champ. or *C. eriodictyonæ* Drake. Pronotum finely punctate, moderately swollen; lateral carinæ not strongly elevated, the areolæ very small, terminating anteriorly just behind the tumid area. Antennæ and legs as in *C. setosa.* Paranota large, rather closely reticulated, the lateral spines wanting except along anterior margin. Median carina very low, not distinctly arched, uniseriate, the areolæ very small. Elytra broad, with lateral spines along the costal margin; tumid elevation very small, not very distinct. Costal area broad, widely reticulated, irregularly triseriate, with some of the nervelets near the base darker and forming an indistinct band. Wings a little longer than abdomen. Areolæ hyaline.

Length, 3.65 mm.; width, 1.82 mm.

Holotype, male, and *allotype,* female, San Miguel, Hidalgo, Mexico, collected by Dr. W. M. Mann, Museum Comparative Zoology. Paratypes, 13 specimens, taken with the type. The smaller hood, unarmed, paranota and elytra, and much smaller tumid elevations of elytra separate this species at once from *C. setosa* Champ., *C. eriodictyonæ* Drake, *C. pacifica* Drake and *C. sphæraceæ* Drake. The lateral carinæ are formed as in *C. setosa* and not as in the other species mentioned above. The hood is not abruptly constricted and much more elevated than the median carina.

Corythucha sagillata, n. sp.

Moderately large, whitish testaceous, conspicuously marked with brown and fuscous. Hood moderately large, strongly and abruptly constricted near the middle, very strongly compressed and narrowed in front; posterior portion mostly brown, inflated and elevated. Median carina about half as high as hood, arched, there biseriate and with a brown patch. Lateral carinæ whitish, raised anteriorly, terminating a little behind the hood. Paranota with brown markings, rather closely reticulated. Antennæ testaceous, clothed with a few extremely long bristly hairs, the apical segment pale brown.

Elytra moderately constricted, with the usual cross-bands; costal area somewhat irregularly triseriate, areolæ (except in transverse bands) hyaline; tumid elevation large, with large brown spot. Wings longer than abdomen. Rostrum extending almost to end of rostral channel, the tip blackish. Legs testaceous. Nervures of elytra, carinæ, hood and paranota with a few erect spines.

Length, 3.51 mm.; width, 2.10 mm.

Holotype, female, and two *paratypes,* females, Santa Catalina Mts., Arizona, July 15, 1925, alt. 5000-6000 ft., collected on *Vauquelinia californica* (Torr.) Sarg. by A. A. Nichol. This is a very pretty and elegantly marked species. It is perhaps most closely allied to *C. elegans* Drake, differing in the larger tumid elevations, more constricted elytra and the different formed hood. The types are in the collection of the author.

OVIPOSITION OF THE ICHNEUMONID *ITOPLECTIS CONQUISITOR* (SAY) IN A LARVA OF *PYRAUSTA NUBILALIS* HUBN.

BY MILTON F. CROWELL

During the summer of 1932 I was fortunate enough to see a female of *Itoplectis conquisitor* (Say) parasitize a larva of the European corn borer, *Pyrausta nubilalis* Hubn.

When first observed the female hymenopteron was running up and down over the upper part of a corn stalk, perhaps a foot below the tassel. Closer examination revealed that she was paying attention to a short section of the stalk just above a hole opening into a tunnel of the corn borer. She approached the hole, felt around it with her antennæ, then proceeded to explore with her antennæ the stalk just above it. After a short time, during which she felt over most of the area of the stalk for perhaps three inches above the hole, she stopped and thrust her ovipositor vertically into the corn stalk. She remained motionless for an estimated time of fifteen to twenty seconds. She then withdrew her ovipositor and flew away.

Cutting open the stalk I found a mature larva of *Pyrausta nubilalis* in the burrow, directly under the spot where *Itoplectis conquisitor* had thrust her ovipositor into it.

CONCERNING THE GENUS NOTIOBIELLA (NEUROPT.-HEMEROBIIDÆ)

BY NATHAN BANKS

In recent years several genera have been made for forms agreeing with *Notiobiella* in having but one series of gradate veins in the fore wings.

Buxtonia Petersen 1928 (Insects Samoa) was based on males with enlarged veinlets in the stigmal area.

Vaja, Navas 1925, from Java and *Ganchetus,* Navas 1929 (Insecta Nova XIII) from Kamerun were based on an elongate pronotum, together with certain slight venational points.

Having a species of *Notiobiella* from the Malay Peninsula which has a long pronotum I have gone over the material in this genus available to me.

Notiobiella was published in 1909 with five species, four from Australia and one from the Fiji Islands. Shortly afterward Needham published a genus, *Annandalia* from India based on one species—*curta.* In my original description of *Notiobiella* I mention *N. unita* as type, so that the genus must be interpreted in this sense. The length of the pronotum varies from much broader than long to almost as long, fully as long, and plainly longer, and one specimen with a pronotum nearly twice as long as broad. This point therefore should not be used as a generic character. The size of the veinlets in the stigmal area used by Petersen for his *Buxtonia* is only developed in the males of certain species; his statement that my *N. stigmatica* would go in his new genus is correct; but I suspect that *N. stigmatica* is the male of *N. unita,* the type of the genus.

Navas mentions that in *Ganchetus* there is in the hindwing a "venulis externis." I have a species from Madagascar that has two such veins in one hind wing, and only one in the other, moreover an Indian species with short pronotum also has a "venulis externis" in each hind wing.

In examining the material I notice that in some species the subcosta and radius are close together and no apparent cross-vein between them, in fact so close together there is no room for a cross-vein; in other species the subcosta and radius are wide apart and with one or two cross-veins. All the species with an elongate pronotum belong to the section with the subcosta and radius close together; these forms also normally have a "venulis externis."

These characters will readily divide the old genus *Notiobiella* in two sections which I shall call genera.

N. unita Bks. the type of the genus has the subcosta and radius close together, the pronotum is hardly elongate in the female, but in *N. stigmatica,* which is a male and may be the male of *N. unita,* the pronotum is narrow in front. *N. viridis* Tilly. also goes here, likewise the species from Madagascar, *N. viridineris* Bks. and *N. valida* Bks., as well as other forms. In all of these forms the face is more elongate than in the species with the radius widely separate from the subcosta. *Annandalia curta* Needham has the radius and subcosta widely separated and connected by two cross-veins. The pronotum is extremely broad; the face is short; the male genitalia are shorter than in *Notiobiella* and in the hind-wing there is rarely a "venulis externis." To this section belong several species, all however from the Old World, and this genus will be Annandalia.

To each genus I can place the following species:

Annandalia Needham 1909.

A. iniquus Hag. (*curta* Needh., *khandalensis* Navas). Common in India.

A. maindronia Navas, may be the same, from India and Formosa.

A. externa Bks. (Notiob.). Australia.

A. obliqua Bks. (Notiob.). Australia.

A. pretiosa Bks. (Notiob.). Fiji Islands.

A. minima Bks. (Notiob.). Malay and Philippines.

A. affinis Bks. (Notiob.). Philippines.

A. jeanneli Navas (Notiob.). East Africa.

A. antennata Navas (Notiob.). Congo Belge.
A. galloisi Navas (Notiob.). Japan.

Notiobiella Bks. 1909.
N. unita Bks. Australia.
N. stigmatica Bks. Australia.
N. viridis Tilly. Australia.
N. viridinervis Bks. India, Malacca, Philippines.
N. valida Bks. Borneo.
N. fulva Petersen (Buxtonia). Samoa.
N. tumida Navas (Vaja) Java, Malacca.
N. africanus Navas (Ganchetus). Kamerun.
N. nitidula Navas. East Africa.
N. subolivacea Nakahara, Japan.
N. mexicanus Bks. Mexico.
N. rubrostigma Navas. South America.
N. bella Navas. Congo Belge.
N. decora Kimmins. Ugana, E. Africa.
N. costalis Bks. Gold Coast, W. Africa.

Besides these I add the following two new species.

Annandalia hageni sp. nov.

Head pale, a black stripe each side from eye toward the mouth; last joint of palpi black; antennæ pale. Thorax and abdomen pale brown, legs pale yellowish, hind tibia with a short dark stripe each side near middle. Wings pale, veins brown, a black dot near base of median vein, and the gradate series dark, stigma not marked. Wings longer than in *A. iniquus*, more than twice as long as broad, the subcosta and radius wide apart as in that species, and a cross-vein one-third way out; first radial sector at its first fork is connected to radius by a cross-vein and the second radial sector is twice forked before the marginal fork; most of the costal veinlets are forked but once, and one or two simple. There is a cross-vein between radius and second radial sector in the fore-wing beyond the stigma (not in other species) and also a cross-vein between the upper branch of the first radial sector and the lower branch of the second radial sector out near the tip close to the marginal forks.

The hind-wing has no markings, and no cross-vein (venulis externis) near tip, and a very short one in the disc between the radial sector and median vein; the radial sector is three branched.

Length of fore-wing 4 mm.

From Ceylon (Hagen Coll.); sent him by Nietner. Type M. C. Z. 17026.

Notiobiella peterseni sp. nov.

Head pale yellowish, a black mark each side from eye to mouth, a rounded black spot below each antenna; vertex with faint dark marks in middle behind; antennæ pale, faintly reddish beyond the base. Pronotum plainly longer than broad, pale, with lateral margins dark; thorax pale, with a dark mark above the base of each fore-wing; legs very pale. Wings pale; veins pale, but with a few dark spots or streaks; stigma not marked, the base of the second radial sector and the connection to the first sector broadly black, also the cross-vein beyond the stigma from the radial sector to radius is broadly black, elsewhere there are several forkings of veins dark, and a cross-vein between cubitus and cubital fork black. In the hind-wings the radial sector is black between its first and second forking. In one hind-wing there is one, and in the other wing two cross-veins between the radial sector and radius beyond the stigma; radial sector with two branches, no cross-vein between fork of median and the cubital veins.

Length of fore-wing 7 mm.

From Tananarive, Madagascar (Challiat). Type M. C. Z. 17027.

Differs from *nitidula* Navas (Engl. E. Africa) as well as others by the mark on face, and mesonotum, mark on radial sector of hind-wing, and the radial sector of fore-wing arises nearer to the base than Navas figures, and many more costal veinlets.

SOME MISCELLANEOUS GERRIDÆ IN THE COLLECTION OF THE MUSEUM OF COMPARATIVE ZOOLOGY (HEMIPTERA)

BY C. J. DRAKE AND H. M. HARRIS,

Ames, Iowa

Through the courtesy of Mr. Nathan Banks, curator of Entomology in the Museum of Comparative Zoology at Harvard University, the writers have received for study a collection of miscellaneous Hemiptera from North and South America. The present paper is based upon the members of the family Gerridæ in this collection. It includes notes on fifteen species, two of which are described as new. The types of these new species are deposited in the museum.

Gerris remigis Say

Guerrero Mills, Hidalgo, Mexico, 3 specimens, collected by W. M. Mann. This is one of the commonest and most widely distributed gerrids in North America. It exhibits marked variation in both size and color. *G. orba* Stål and *G. robusta* Uhler are both synonyms of *remigis* Say.

Gerris nyctalis Drake and Hottes

Three specimens, Nicholsville, Newfoundland, Aug., collected by G. K. Noble; and one specimen, Sand Cove, Newfoundland, Aug. 25, Fernald. Heretofore known only from the Rocky Mountain regions of United States and Canada.

Gerris dissortis Drake and Harris

Romaine Brooks, Newfoundland, Aug., G. K. Noble.

Gerris incognitus Drake and Hottes

Moscow, Idaho, A. C. Burrill, collector; and Metlakatla,

B. C., Keen, collector. This species is quite common in western North America.

Gerris buenoi Kirkaldy

Several specimens, Romaine Brook, Newfoundland, August, G. K. Noble. The range extends from coast to coast in North America.

Gerris chilensis (Berg)

Curico, Chile, 4 specimens. This insect is quite common in Argentina and Chile.

Gerris cariniventris Champion

Furcy, Hayti, 2 females, collected by W. M. Mann.

Gerris carmelus, n. sp.

Moderately large, clothed above with extremely fine golden pubescence. Head black, its sides and under-surface and a transverse patch above at the base ochraceous, sometimes these markings more or less replaced with black. Antennæ brown, darkened apically, the first segment with a few short setæ near its tip; formula, 40:30:30:27. Rostrum ochraceous, distal segment black, extending beyond apex of mesosternum. Pronotum black, the sides and a median elongate spot on disc of anterior lobe ochraceous; the apex rounded, attaining middle of mesonotum. Mesonotum ochraceous, strongly raised, tumid, almost rectangular in outline. Sides of thorax ochraceous, the meso and metapleura with a longitudinal blackish stripe, this at times extending on propleuron. Legs brownish, the intermediate femora each produced at the apex into two conspicuous, sharp, claw-like spines. Abdomen above blackish. Venter ochraceous. Length (♂ ♀), 7-8.5 mm.; width 2-2.6 mm.

(Male). Anterior lobe of pronotum strongly raised and sharply delimited from posterior lobe. Front femora somewhat incrassate and bowed, the inner surface a little behind the middle strongly dilated into a prominent blackish tubercle. Venter indistinctly carinate along the median line, the sixth segment about as broad as the fifth; its apical margin deeply and roundly excavated at the middle. First genital segment very long, slender and cylindrical.

(Female). Broader than male. Anterior lobe of pronotum only feebly raised above posterior lobe. Metanotum with a prominent, raised callosity on each side, these callosities pale and conspicuously hairy. Connexivum broader than in male, clothed along apical half with brownish hairs, these becoming longer and more numerous distally; the apices strongly produced into long, upwardly curving, hairy processes. Mesosternum and venter carinate down the middle. Sixth segment without carina, more thickly pilose than the fifth and more than twice as long.

Holotype, no. 17024, M. C. Z. apterous male, and *allotype,* apterous female, Jamaica, near Troy, May 12, 1909, A. E. Wight, collector. *Paratypes,* 6 males and 8 females, taken with type.

This species apparently is nearest related to *G. cariniventris* Champion. Its color markings are somewhat variable. From *cariniventris* it may be recognized by the larger, more prominent tubercular dilations of the anterior femora and the more deeply excavated sixth segment of the venter in the male, and the strongly produced connexival apices in the female.

Limnogonus guerini Lethierry and Severin

Gerris marginatus Guerin, Icon. R. An. Ins., 1844, p. 351, pl. 57, fig. 2; in Sagra, Hist. de Cuba, Ins. 1857, p. 173.

Limnogonus guerini Lethierry and Severin, Cat. Gen. Hem., III, 1894, p. 61.

Many apterous and alate specimens:—Port Antonio, Jamaica, Jan. 1, 1906, A. E. Wight; Grande Anse, Haiti, P. R. Uhler; St. Moore, Haiti, Jan. 1913, W. M. Mann; San Domingo, P. R. Uhler; Rio Bayamo, Cuba, Dr. Thomas Barbour; Bajo, Calif., one female, N. Banks.

This species is widely distributed and is very common in the West Indies and Central America. Long series of specimens from Honduras, Guatemala and the islands of the West Indies show that there is variation in size and considerable modification in the color markings. The female specimen from Baja, California, Collection of Nathan Banks, greatly extends the range of the species. The record indicates that the form from California described by Stäl as *Limnogonus (Gerris) franciscanus* may be *L. guerini.*

Limnogonus aduncus, n. sp.

Apterous Male: Dark brownish to black. Size and general aspect similar to *Limnogonus recurvus* D. & H. Head and pronotum with markings as in that species. Antennæ dark brown; proportions, 104:88:68:87. Rostrum dark-brown, the apical segment blackish, reaching upon the anterior portion of mesosternum. Front legs dark brown, stout, the femora slightly bowed and flattened beneath. Pronotum black, indistinctly margined with fulvous; anterior lobe moderately tumid, with two short ochraceous lines on the disc; posterior lobe broadly rounded behind, extending upon base of metanotum, with a median ochraceous line. Abdomen above with a median longitudinal ochraceous line. Body beneath yellowish brown with grayish pubescence, the mesosternum large, the venter with a broad, blackish, submarginal stripe. Legs proportioned as in *recurvus*. Connexivum moderately broad, slightly produced at apex, segments two, three, and four each with a prominent pale spot. Venter somewhat flattened, hairy along posterior margin, the last segment almost twice as long as the preceding. Genital segments large, dark brownish, segment I depressed on each side of a median raised portion which becomes narrowed posteriorly and ends in a distinct, recurved, blackish hook. Length, 9 mm.; width, 1.62 mm.

Apterous Female: Broader and stouter than male, brownish black. Finely pubescent, the sides of pronotum, the intermediate and posterior acetabula, and second and third segments of connexivum silvery. Antennæ brownish; proportion, 92:72:III and IV absent. Abdomen above with a broad, median, longitudinal flavous to fulvous stripe. Connexivum distinctly, triangularly produced behind. Anterior legs slightly bowed. Last segment of venter nearly twice as long as preceding, its hind margin convexly sinuate at the middle. Length, 8.82 mm.; width, 2.15 mm.

Winged Male: Pronotum with the humeri raised and prominent, the anterior lobe with a distinct indentation at the middle of each pale stripe. Hemelytra brownish black, reaching beyond tip of abdomen. Antennæ mutilated.

Holotype, no. 17025, M. C. Z. apterous male, San Fidelio, Brazil, February, Thayer Expedition. *Allotype,* apterous female, Rio Janeiro, Brazil. *Paratype,* winged male, taken with holotype.

This species is most closely allied to *Limnogonus recurvus* D. & H., from which it may be separated by the proportional lengths of the antennal segments and especially the structure of the male genitalia. In the former the first genital segment bears a large prominent and strongly tumid protuberance in front of its apical hook.

Metrobates denticornis (Champ.)

Trepabotopsis denticornis Champion, Biol. Centr.-Amer., Rhyn. II, 1898, p. 158, pl. IX, fig. 26.

Two specimens, Los Amates, Guatemala; collected by Kellerman.

Metrobates tumidus Anderson

Metrobates tumidus Anderson, Jour. Kansas Ent. Soc., V, 1932, p. 57.

Metrobates cubanus Drake and Harris, Ann. Carn. Mus., XXI, 1932, p. 86, pl. II, figs. 2 e, 4 e.

Several examples, Grand Ainse, Haiti; collected by P. R. Uhler.

Platygerris depressus White

Ten specimens, all apterous, Los Amates, Guatemala, collected by Kellerman.

Trepobates trepidus Drake and Harris

One female, with mutilated wings, Los Amates, Guatemala.

Trepobates pictus (Herrich-Schäeffer)

A single apterous female, Pt. Antonio, Jamaica, A. E. Wight.

Trepobates taylori (Kirkaldy)

Kallistometra taylori Kirkaldy, Entomologist, XXXII, 1899, p. 28; Kirkaldy and Bueno, Ent. Soc. Wash., X, 1907, p. 212.

Trepobates pictus Uhler, Proc. Zool. Soc. Lond., 1894, No. XV, p. 213.

Trepobates comitialis Drake and Harris, Fla. Ent., XII, 1928, p. 7; Bul. Brook. Ent., XXVII, 1932, p. 117.

The type of *Kallistometra tayloi* Kirk. (♀, St. Andrew, C. B. Taylor, Sept., 1898) in the Kirkaldy collection, U. S. National Museum has been examined. It is a typical species of *Trepobates* Uhler and belongs to the group having the posterior margin of the mesonotum in the apterous form subtruncate and not produced at the middle. The type specimen is badly mutilated, having the appendages all wanting on the right side, the last two segments of the left antennæ missing and also the tarsi of the second and third legs. As the data on the locality, date, and collector labels and type specimen in the Kirkaldy collection of the U. S. National Museum agree with the original description (except length of legs), there seems to be no question regarding identity of the type specimen of *Kallistometra taylori;* furthermore, the labels are written in Kirkaldy's own handwriting. After carefully studying this type (genotype) and numerous other examples the writers feel that the genus *Kallistometra* Kirkaldy must be suppressed and considered identical with the genus *Trepobates* Uhler. *Trepobates comitialis* D. & H. should be treated as a synonym of *taylori.*

In the Kirkaldy collection there are also two specimens (♂ and ♀) of *Metrobates tumidus* Anderson (=*Metrobates cubanus* D. & H.) labeled in Kirkaldy's handwriting "cotype," "Jamaica, C. B. Taylor." These specimens were not mentioned in the original description.

Several specimens are also in the Museum collection from Cuba, Ch. Wright; S. Domingo, P. R. Uhler; Mandeville, Jamaica, A. E. Wight; and Martinique. These specimens are all apterous (some nymphs) and in rather poor condition of preservation.

NOTES ON THE GENUS DYSDERCUS (HEMIPTERA-HETEROPTERA) IN TRINIDAD, B. W. I.

BY E. O. PEARSON

The work on which this paper is based was carried out partly at the Imperial College of Tropical Agriculture, Trinidad, between February and June, 1930, and partly at the Museum of Comparative Zoölogy, Harvard University, during the present year. The author is indebted to these two institutions and also to the United States National Museum for access to their collections, and to Mr. W. E. China, of the British Museum, for assistance and advice with regard to the identification of the species.

The first record of the genus from Trinidad is contained in Ballou's (1906) paper on the West Indian Cotton Stainers, in which he describes a new species, *Dysdercus howardi,* and its variety, *D. howardi* var. *minor,* from material collected in the island.

D. howardi var. *minor* has recently been synonomized with *D. ruficollis* L. by Hussey (1929) and in the same paper *D. andreæ* L. is recorded from the island. The latter error is apparently based on a reference by Myers (1927) to this species in the Trinidad Mountains of Cuba. Apart from a number of papers dealing with the life history and bionomics of the genus from an economic point of view (Guppy and Thornton, 1911; Urich, 1916; Withycombe, 1924; Hewison and Symond, 1928) no further work has been done on the nature of the species occurring in the island.

There are, in point of fact, four well marked species in the island and in view of the fact that in certain cases these species have been inadequately described and that in every case an examination of the material in the collections mentioned above has shown the distribution of these species to be considerably wider than that previously recorded, these have been re-described below.

Dysdercus howardi Ballou

Dysdercus howardi Ballou, West India Bull., VII, 69 (1906).[1]

The head, except the black eyes, antennæ, except the piceous terminal joint with a basal eburneous ring, rostrum, except the piceous terminal joint, anterior callus and lateral flanges of the pronotum, episterna, each margined anteriorly with a fine black line, legs, except the black distal joints of the tarsi, ferruginous (5'i-7'i-9'i)* the upper surface of a redder tone than the lower; the posterior disc of the pronotum pale luteous (21''d), margined anteriorly with a very fine impressed black line, posteriorly with a narrow black fascia which is itself narrowly albido-limbate; the scutellum fulvous (13'-13'i); the hemelytra luteous (19''), membrane black, the apex narrowly albidolimbate; the anterior collar of the pronotum, margined posteriorly by a fine impressed black line, the epimera and the acetabula, eburneous; the abdominal sternites pale luteous, frequently with a greenish tinge (21''d-23''d-25'''d), margined anteriorly on the second to sixth visible abdominal sternites with a narrow black line, broader on the posterior segments, the fifth and sixth sternites of the male with a fulvous band (13') covering all but the extreme posterior margin.

The anterior collar and posterior disc of the pronotum, the clavus and the corium, thickly punctate; the epimera and acetabula more sparsely punctate, the rest of the body impunctate.

The rostrum reaching in the female to the middle, in the male to the posterior margin of the second visible abdominal sternite.

The male parameres with two spurs projecting downwards toward the ventral surface; the distal one projecting nearly twice as far as the proximal one, narrow, cylindrical, acute, perpendicular to the axis of the paramere; the proximal one in the same plane, broad at the base, the apex forming a backwardly directed hook; the shaft of the paramere with a lateral flange arising from the outer ventral surface; the distance between the tips of the spurs roughly twice as great as that between the tip of the proximal spur and the apex of the lateral flange.

---

* In order to define these colors more exactly the specimens have been compared with the plates in Ridgeway's "Color Standards and Color Nomenclature" (1912), to which these numerals and letters refer. The words used to describe the colors, however, are those in common use and do not refer to Ridgeway's names.

Length, from the apex of the clypeus to the tip of the membrane of the hemelytra: ♀♀ 12.5-15.0 mm. ♂♂ 11.5-12.5 mm.

Maximum breadth of the pronotum: ♀♀ 3.4-3.8 mm. ♂♂ 3.0-3.4 mm.

These measurements were made on only seven specimens; from measurements made in Trinidad on a longer series it appears that the limits of size are greater than those indicated above.

Localities: Trinidad, B. W. I.[1]
British Guiana (Georgetown).
Brazil (Bonito, Prov. Pernambuco; Natal).

The color is subject to some variation. In some specimens from Trinidad the head, disc of the pronotum, scutellum and hemelytra, except the extreme costal margin, are more or less infuscate, the antennæ, rostrum and legs being castaneous, verging at their apices to black. Occasionally a faint fuscous spot is developed towards the inner angle of the corium and the infuscation on the head and pronotum may take the form of irregular patches. Specimens from British Guiana follow the same course of variation. Those from Brazil are somewhat smaller than the above, more deeply infuscate and sometimes have the head completely black. The shape of the parameres, however, is a sure guide to the identity of the specimen.

Specimens of *D. discolor* Walker from the Lesser Antilles have parameres which differ only very slightly from those of *D. howardi* and whilst in general the coloration of this species is distinct, it is of interest to find that specimens, particularly from those islands closest to Trinidad, (Grenada, Bequia, St. Vincent and St. Lucia), occasionally are found in which the usual sanguineous suffusion is lacking, these specimens in color approaching very closely to Ballou's species. *D. discolor* Walk. and *D. howardi* Ballou are thus evidently very closely related species, derived from a common South American continental stock and exhibiting progressive differentiation as they are followed up the line of the Lesser Antilles.

In Trinidad this species has been found feeding and breeding on the seeds and unopened bolls of all varieties of cultivated cotton, on the local "wild" cottons *(Gossypium purpurascens* and *G. peruvianus),* on the seeds of the ripe pods of the silk cotton tree, *Eriodendron anfractuosum,* on the capsules of *Hibiscus cannabinus* and *Hibiscus sabdariffa,* and on the fruits of *Malachra capitata* and *Thespesia populnea.*

Dysdercus maurus Distant

Dysdercus maurus Distant, Trans. Ent. Soc. Lond., 590 (1901).[1]

Dysdercus howardi var. *minor* Ballou, West India Bull. VII, 70 (1906).[2]

Dysdercus howardi var. *minor* Ballou=*Dysdercus ruficollis* L., Hussey, Gen. Cat. Hem., Fasc. III, 101 (1929).

The head above, antennæ, except the basal eburneous ring of the terminal joint, rostrum, except the castaneous base, and legs, black; the anterior callus and lateral flanges of the pronotum ferruginous (5'i); the posterior disc of the pronotum pale luteous (21"d), margined anteriorly by a very fine impressed black line and posteriorly by a broader black line, which is itself posteriorly narrowly albido-limbate; the abdominal sternites pale luteous, sometimes with a greenish tinge (21"d-23"d-25'"d), the second to sixth visible sternites with a very narrow black anterior margin, finer on the discal region and broader as a whole on the posterior sternites; the head below, the episterna, each margined anteriorly by a fine black line, coxæ and trochanters, lateral flanged margin of the abdomen, the whole of the fifth and the anterior half of the sixth visible abdominal sternite in the male, fulvous (13'-13'i); the anterior collar of the pronotum, margined posteriorly by a fine impressed black line, the epimera and the acetabula, eburneous; the hemelytra, except the extreme costal margins, which are luteous, deeply infuscate, with a small spot towards the inner angle of the corium, accompanied by a streak following the course of the radial vein, black; the membrane black, the apex narrowly albido-limbate.

The anterior collar and posterior disc of the pronotum, the epimera and acetabula, sparsely punctate; the clavus and the corium thickly punctate; the rest of the body impunctate.

The rostrum reaching to the posterior margin of the second visible abdominal sternite.

The male parameres with two spurs projecting downward toward the ventral surface, both short, of approximately equal length, obtuse, cylindrical, the distal one perpendicular to, the proximal one forming an acute angle with the axis of the paramere, the shaft of the paramere with a strongly dorsally reflected flange arising from the outer ventral surface, the distance between the tips of the spurs roughly equal to that between the tip of the proximal spur and the apex of the lateral flange.

Length, from the apex of the clypeus to the tip of the membrane of the hemelytra: ♀♀ 9.5-12.5 mm. ♂♂ 7.5-11.5 mm.

Maximum breadth of the pronotum: ♀♀ 2.5-3.1 mm. ♂♂ 2.0-3.0 mm.

Based on measurements of a series of thirty-five specimens from Trinidad.

Localities: Trinidad, B. W. I.[2]
Brazil (Quipapa, Pernambuco;[1] Joazino, Queimada and Portello, Bahia; Paô d'Assucon; Campinas; Ceara Mirim; Independencia; Natal).
Colombia (Cali; Santa Marta).
Argentine (Tucuman).

The color of this species is exceedingly variable. In the pallid forms the head, rostrum, antennæ, legs, posterior disc of the pronotum, scutellum, clavus and corium are identical in color with the same parts of the body of *D. howardi* Ballou, which they also approach in size. They may be distinguished from the latter species by the relatively narrower anterior black margins to the abdominal sternites and very readily by the male parameres. These pallid forms appear to be characteristic of the species as it occurs in Trinidad, but every grade of color exists between such forms and the extreme melanic type, which differ from the description given above in that the entire posterior disc of the pronotum and the hemelytra are black. The specimens from Brazil correspond more closely than those from Trinidad with the description given by Distant, the abdomen below being uniformly of a pale luteous color with no trace of a greenish tinge, while the episterna, coxæ and maculæ of the two posterior abdominal sternites in the male are pale ochraceous (15'b) and not fulvous.

D. maurus has some affinities with *D. howardi* in the shape of the parameres as well as in the color of the more pallid forms and the two species are also related in the same manner to two distinct but undescribed species occuring in Brazil, Paraguay, Bolivia and the Argentine Republic. The four species form a complex which, judging from the synonomy and from a number of incorrectly determined specimens, has long been confused with *D. ruficollis* L. I have not had the opportunity to examine any type material of Linné's species, but there can be little doubt that Fabricius' species *Lygæus annulus* (1803) is a color form of Linné's species. This fact is placed beyond reasonable doubt by Stäl's statement (1866) that *L. annulus* Fabr. is a variety of *D. ruficollis* L. with the hemelytra distinguished by a black hinderpart or a black fascia.

I have examined Linnaeus' type in the Museum of Upsala. The identity of *L. annulus* Fabr. is clear from the figure given by Hahn (1834) for *Pyrrhocoris annulus*=*L. annulus* Fabr., which is distinguished by the shape of the pronotum and by the fact that the transverse impressed line between the anterior callus and the posterior disc of the pronotum is not straight, as in most species, but has an anteriorly directed nick on the mid-dorsal line.

D. ruficollis L. would be intermediate between Hahn's vars. *b* and *c*, having the black head of the former and the immaculate hemelytra of the latter. I have examined a number of specimens, some of them already determined as *D. annulus* Fabr. by Uhler, and I am satisfied that these represent the true *D. ruficollis* L. and its synonyms, *D. annulus* Fabr. and *D. fulvo-niger* DeGeer. These all possess characteristic and identical genitalia, distinct from those of other New World species. All these specimens have a basal eburneous ring to the terminal joint of the antennæ, as in the original descriptions and since this character appears to be of first class taxonomic value in the genus it is impossible to accept the statements of Burmeister (1835), Stål (1870) and Distant (1883) to the effect that specimens of *D. ruficollis* L. sometimes occur in which the terminal joint of the antenna is unicolorous. Distant, in particular, appears to have been very much in doubt as to the identity of the species, for in Biologia Centrali Americana, Hemiptera-Heteroptera, Vol. I, Tab. XXI, he figures as *D. ruficollis* L. a specimen of *D. mimus* Say (fig. 20) and a pallid color form of *D. flavolimbatus* Stål (fig. 19), while nineteen years later (Distant, 1902) he describes as a new species, *D. clarki*, what is apparently none other than a somewhat melanic specimen of the true Linnean species *D. ruficollis*.

D. maurus Dist. differs little in its bionomics in Trinidad from *D. howardi* Ballou. It occurs on the same food plants, usually in smaller numbers than the larger species, although at times it is more numerous.

It would appear, from Withycombe's reference (1924) to a small, dark or otherwise aberrant form of *D. howardi* and also from a number of specimens identified by him in the Coll. Imperial College of Tropical Agriculture, that he considered *D. maurus* to be merely a seasonal or diet-produced phase of *D. howardi*. The characteristic genitalia, however, show that this is not the case.

Dysdercus mimus Say

Capsus mimus (excl. vars.) Say, Heter. N. Harm. 20 (1832).[1]

Dysdercus albidiventris Stäl, O. V. A. F. XI, 236 (1854).[1]

Dysdercus lunulatus Uhler, Proc. Ent. Soc. Phila. I, 24 (1861).[1]

Dysdercus albidiventris Uhler, Bull. U. S. Geol. Geogr. Surv. I, 314 (1876).[2]

Dysdercus albidiventris Distant, B. C. A. Het., I, 229 (1883).[3]

Dysdercus ruficollis (excl. syn.) Distant, B. C. A. Het., I, 233; Tab. XXI, fig. 20 (1883)

Dysdercus albidiventris Hussey, Bull. Brookl. Ent. Soc., XXII, 235 (1927).

Dysdercus mimus Hussey, Gen. Cat. Hem. Fasc. III, 95 (1929).[4]

The head, except the black eyes, and the anterior callus of the pronotum, ferruginous (8'h), the latter with a slightly yellower tinge than the former; the episterna, coxæ, femora, proximal joints of the rostrum and the maculæ covering, in the male, the anterior part of the disc of the fourth, the greater part of the fifth and the anterior half of the sixth visible abdominal sternites, and in the female the anterior half of the fourth, fifth and sixth visible abdominal sternites, orange-ferruginous (11'i); the posterior disc and lateral flanges of the pronotum, the clavus and the corium, luteous (17''); the abdominal sternites pale luteous (21''d); the anterior collar of the pronotum, margined posteriorly by a fine impressed black line, the epimera and acetabula, eburneous; the antennæ, scutellum, distal joints of the legs and rostrum, the very narrow anterior margins to the second to sixth visible abdominal sternites, and the membrane, black, the last named narrowly albido-limbate at the apex.

The clavus and corium thickly punctate, the anterior collar and posterior disc of the pronotum, the epimera and the acetabula, more sparsely punctate, the rest of the body impunctate.

The rostrum reaching the posterior margin of the second visible abdominal sternite.

The male parameres with two spurs projecting downward toward the ventral surface; the distal one perpendicular to the axis of the paramere, dorso-ventrally flattened, tapering to a point; the proximal one in the same plane as and with its distal edge parallel to the distal one, but broader, laterally flattened and with the apex forming an acute, sharply recurved hook, and with a tooth on the proximal edge which is transverse and chisel-like; the shaft of the paramere with a dorsal longitudinal ridge and a lateral flange arising ventrally on either side, the inner one prominently projecting; the axis of the proximal spur roughly midway between that of the distal spur and the anterior margin of the inner lateral flange of the shaft.

Length, from the apex of the clypeus to the tip of the membrane of the hemelytra: ♀♀ 10.5-13.0 mm. ♂♂ 8.0-10.5 mm.

Maximum breadth of the pronotum: ♀♀ 2.7-3.5 mm. ♂♂ 2.1-2.8 mm.

Redescribed from material collected in Trinidad, 1930.

Localities: U. S. A. (Arizona,[4] California,[2,4] Texas[2,4]).
British Guiana (Georgetown).
Mexico[1,4] (Tampico, Vera Cruz).
Guatemala[3,4] (Alta V. Paz, Ayutla, Los Amates).
Honduras[4] (La Ceiba, Tegucigalpa).
Salvador.
Nicaragua.[3,4]
Costa Rica.[3,4]
Panama[2,3,4] (Ancon and Mt. Hope, C. Z.).
Colombia[4] (Aracataca, Santa Marta).
Ecuador[4] (Chimbo).
Bolivia (Prov. Sara).
Brazil (Igaripe and Manaos, Amazonas; Para).
British Guiana (Georgetown).
Venezuela (Cumaragua).
Trinidad, B. W. I.
Cuba (Santiago de las Vegas).

The variation amongst Trinidad specimens is not striking, running usually towards the production of smaller, more sordid forms, in which the color of all parts of the body is infuscate, this infuscation on the posterior disc of the pronotum occasionally taking the form of an irregular patch. The specimens examined from Cuba, Colombia, Venezuela, British Guiana, Bolivia and Brazil are similar to those from Trinidad. Specimens from Panama are usually larger in size, with a more pallid coloration, little infuscation, the membrane brownish and the scutellum frequently yellowish and not black. Possibly they represent a distinct geographic race. I have been fortunate in being able to examine a long series from the same locality in Guatemala (23 ♀ ♀ and 34 ♂ ♂), in which every shade of variation occurs between specimens which are identical with those from Trinidad, with the hemelytra immaculate, and specimens which agree with the descriptions given by Say (1832) and Stäl (1854), having the whole posterior disc of the pronotum infuscate and a large, inwardly directed, black fascia on the corium.

Specimens from Mexico, Honduras, Salvador and Costa Rica follow the same course of variation, while in a number of specimens from Ecuador the fascia on the corium covers the whole of the apex.

All these different color varieties share the characteristic parameres described above and may be recognized on superficial examination by the unicolorous antennæ, the fact that the lateral flanges of the pronotum are luteous and not, as is usually the case, the same color as the anterior callus, by the infuscation of the discs of the posterior abdominal sternites in the female and usually by the black scutellum. It may be remarked that forms of *D. mimus* Say with the hemelytra immaculate may be difficult to distinguish from similarly pallid forms of *D. mimulus* Hussey, but it is possible to do so from the fact that *D. mimulus* rarely has the disc of the pronotum immaculate, there being usually a sharply defined posterior black margin, whereas in *D. mimus* the black fascia, where it occurs, merges indefinably into the paler color. Moreover, in *D. mimulus* the black anterior margins to the abdominal sternites are relatively broader and more sharply defined than in *D. mimus*.

An examination of the male parameres, of course, reveals the nature of a doubtful specimen immediately.

In Trinidad this species is found feeding and breeding on the same plants as support the two preceding species, but it is distinguished by its penchant for the low-lying weeds of the genus Sida (Malvaceæ), which are common along the sides of roads and traces and in other rather exposed and dusty situations. With the exception of one occasion on which a number of migrants of *D. maurus* Dist. were found, *D. mimus* was the only species ever taken on Sida and indeed it was unusual to find an association of these plants which did not support a small colony of the species.

D. mimus is a much rarer species in Trinidad than either *D. howardi* or *D. maurus.*

Dysdercus fernaldi Ballou

Dysdercus fernaldi Ballou, West India Bull., VII, 68 (1906).[1]

The head, antennæ, except the basal eburneous ring of the ultimate joint, rostrum, legs, anterior callus and lateral flanges of the pronotum, rufous (9') ; the color of the lateral flanges encroaching onto the sides of the posterior disc of the pronotum, which is pale luteous (21''d), with a sub-basal fuscous margin, itself posteriorly narrowly albido-limbate; hemelytra buff-yellow (19''d) : abdominal sternites, epimera, acetabula and the pronotal collar, eburneous; scutellum, episterna, the lateral flanged margins, the incisures, very narrowly, the whole of the fifth and the anterior half of the sixth visible sternites of the abdomen, orange-rufous (11') ; the membrane fuscous, narrowly albido-limbate.

Clavus and corium thickly punctate, anterior collar and posterior disc of the pronotum, epimera and acetabula, more sparsely punctate, rest of the body impunctate.

Rostrum reaching to the middle, if not to the posterior margin of the third visible abdominal sternite.

The male parameres with the shaft in the form of a prism, of which the ventral surface is hollowed out and the dorsal ridge is extended distally to form a long, downward curving, cowl-shaped structure, of which the outer edge is toothed like a saw and bears at the proximal end a long, curved spine.

Length, from the apex of the clypeus to the tip of the membrane of the hemelytra X Maximum breadth of the pronotum:

Grenada	♂ ♂	10.5-11.5 mm. X 2.8-2.9 mm.
	♀	12.5 mm. X 3.0 mm.
Trinidad	♂	11.8 mm. X 2.9 mm.
Brazil	♂	11.8 mm. X 2.8 mm.
	♀ ♀	10.0 - 12.0 mm. X 2.6 - 3.0 mm.
Colombia	♂	14.0 mm. X 3.7 mm.
Bolivia	♂ ♂	12.2 - 14.0 mm. X 2.8 - 3.7 mm.
	♀ ♀	13.0 - 14.0 mm. X 3.3 - 3.7 mm.

I have been able to examine so small a number of specimens that I have not felt justified in giving an average figure for the above measurements.

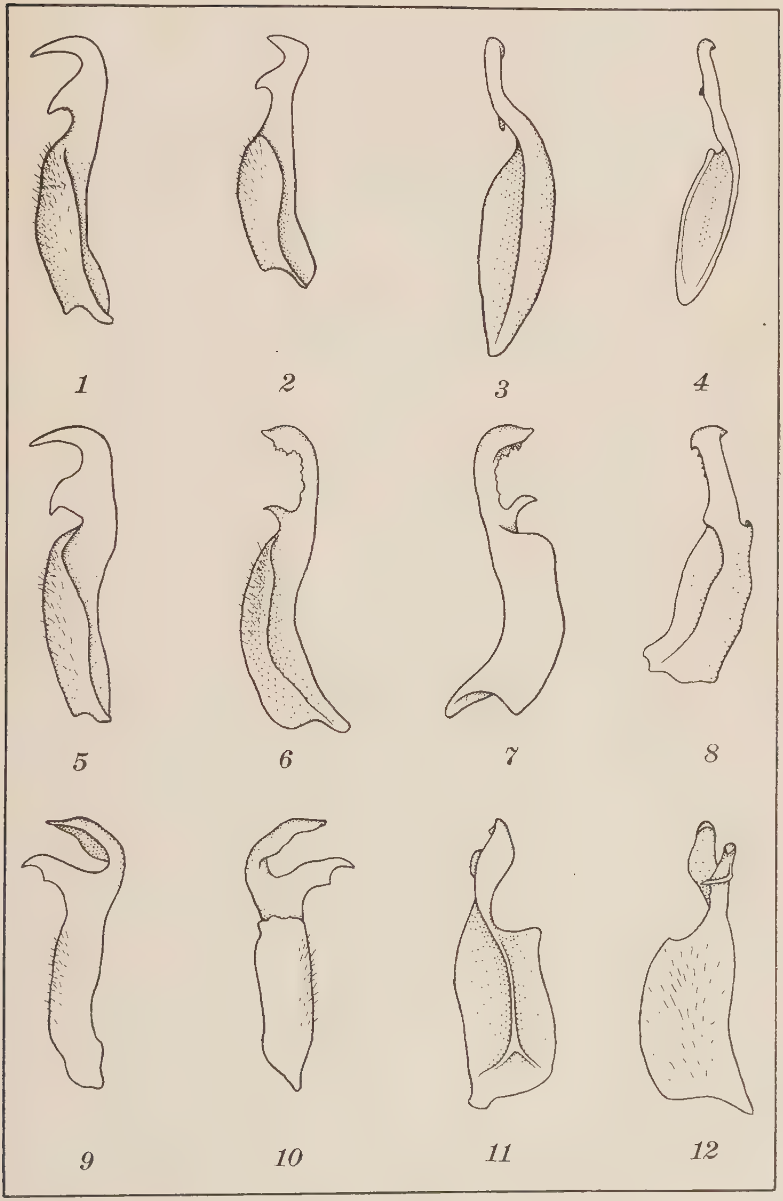
Localities: Grenada, B. W. I.[1]
Trinidad, B. W. I.
Colombia (Cali).
Peru (Chanchamayo, Lucma).
Brazil (Manaos; Para; Porto Velho, Matto Grosso; Rio de Janeiro).
Bolivia (Prov. Sara).
Argentine (Tucuman).

The specimens from Grenada, all of which correspond very closely with the type specimen in the U. S. N. M., are of a richer color than that described above, which is based on a single male specimen from Trinidad in the M. C. Z., Harvard University. In Grenadan specimens the head is a clearer red (7), the hemelytra orangeochraceous (14'), the posterior disc of the pronotum more or less suffused with black, the legs and antennæ verging castaneous distally, the apical angle of the corium suffused with black and the incisures of the abdomen frequently narrowly black.

The Brazilian specimens are identical with the one from Trinidad.

The specimens from other parts of South America are larger than the preceding and show some distinctions in the color, being generally of a duller shade and having, in some cases, broader black fasciæ where in the specimens described above such fasciæ are very pale and narrow. They possess, however, the very characteristic parameres in an unmodified form and share with specimens from the type locality the peculiarity that the reddish color of the anterior callus and lateral flanges of the pronotum en-

Psyche, 1932 Vol. 39, Plate 4.



Pearson—Dysdercus

croaches onto the sides of the posterior disc. They have therefore been regarded as belonging to Ballou's species, the range of which is thus considerably amplified.

I did not, to my knowledge, take this species in Trinidad and can therefore give no information as to its food plants. There is, however, a single male in the Coll. M. C. Z. from Port of Spain, Trinidad and no doubt the similarity in coloration to *D. howardi* and pallid specimens of *D. maurus* has caused it to be overlooked by collectors. I understand, nevertheless, that even in Grenada it is rare.

LITERATURE CITED

Ballou, H. A. (1906): West India Bulletin, VII, 64.

Burmeister, H. (1835): Handbuch der Entomologie, II, 285.

Distant, W. L. (1883): Biologia Centrali Americana, Heteroptera, I, 233.

Distant, W. L. (1902): Annals and Magazine of Natural History, Series 7, IX, 43.

Fabricius, J. C. (1803): Systema Rhyngotorum, II, 227.

Guppy, P. L. and Thornton, T. (1911): Board of Agriculture of Trinidad and Tobago, Circular 6.

Hahn, C. W. (1834): Die Wanzenartigen Insecten, II, 13; Tab. XXXVIII, fig. 123.

Hewison, H. K. and Symond, J. E. (1928): Empire Cotton Growing Review, V, 48.

Hussey, R. F. (1929): General Catalogue of the Hemiptera, III, 101.

Myers, J. G. (1927): Annals Entomological Society of America, XX, 300.

Stal, C. (1867): Berliner Entomologische Zeitschrift, X, 382.

Stal, C. (1870): Enumeratio Hemipterorum, I, 123.

Urich, F. W. (1916): Bulletin Department of Agriculture of Trinidad and Tobago, XV, No. 1.

Withycombe. C. L. (1924): Bulletin of Entomological Research, XV, 171.

EXPLANATION OF PLATE 4.

1. *D. howardi* Ballou (Trinidad). Right paramere, right side.
2. *D. maurus* Distant (Trinidad). Right paramere, right side.
3. *D. discolor* Walker (Grenada). Right paramere, dorsal surface.
4. *D. maurus* Distant (Mirim Ceara, Brazil). Right paramere, dorsal surface.
5. *D. discolor* Walker (Grenada). Right paramere, right side.
6. *D. fernaldi* Ballou (Trinidad). Right paramere, right side.
7. *D. fernaldi* Ballou (Trinidad). Right paramere, left side.
8. *D. fernaldi* Ballou (Grenada). Right paramere, dorsal surface.
9. *D. mimus* Say (Trinidad). Right paramere, right side.
10. *D. mimus* Say (Trinidad). Right paramere, left side.
11. *D. mimus* Say (Guatemala). Right paramere, dorsal surface.
12. *D. mimus* Say (Honduras). Right paramere, ventral surface.

All approximately 40 times natural size, drawn with camera lucida under low power of microscope.

LOCAL DISTRIBUTION OF *FORMICA ULKEI* MOUND-NESTS WITH REFERENCE TO CERTAIN ECOLOGICAL FACTORS[1]

By W. A. Dreyer

Department of Zoology, University of Cincinnati

and

Thomas Park

Department of Zoology, University of Chicago

Introduction

The existence of a number of mound-nest colonies of the ant *Formica ulkei* Emery at Palos Park, Illinois, has been known for several decades. In recent years various phases of ecology and physiology of this ant and its nests have been analyzed and published. Holmquist (1928) reported at length on its life-history and hibernation; Orlando Park (1929) discussed certain myrmecocoles associated with it in the nests; Thomas Park (1929) reported the occurrence and behavior of a thief-ant intimately found in the mounds, and Dreyer (1932) has analyzed certain aspects of the respiratory behavior of this ant in relation to its hibernation. Up to the present time no accurate description of the extent and distribution of these mounds has been attempted. In this paper they will be discussed with reference to their individual form, their distribution, and certain environmental factors correlated with this distribution.

---

[1] The authors take pleasure in acknowledging their appreciation to Professor W. C. Allee, of the University of Chicago, for his kindly aid and criticism of this work.

Field Survey

The Palos Park region lies in the Valparaiso moraine about twenty miles southwest of Chicago. It is a rolling upland, situated to the south and east of the Des Plaines river, traversed by the Sag[1], a small stream flowing in a westerly direction into the Des Plaines. Most of the region is covered with a thick growth of the mesic oak-hickory type of subclimax forest characteristic of the morainic uplands of the Chicago region. (Cowles 1901). The mound-nests of *Formica ulkei* found here are concentrated in an area of approximately one quarter mile square in which the forest is cut up by a number of open lanes of swampy meadow providing for local drainage towards the west. Several temporary ponds are present in the spring but by early summer there is no surface water except at times of rain. The substratum consists of a thick layer of glacial drift, yellow clay and boulders, with a thin layer, two to six inches, of black humus surface soil.

A careful survey of this area in which all the mounds were tabulated according to size, location, and activity, reveals the presence of 435 mounds of *Formica ulkei.* These vary in size from mounds about one foot in diameter and six inches in height to five feet in diameter and three feet in height. Typically, the mounds have a somewhat matted thin surface layer composed of finely divided soil and organic debris such as twigs, stems, bits of leaves, and fragments of insects. The surface is perforated with many entrances to the interior which is finely ramified with well defined galleries, one to two centimeters in diameter. These extend throughout the mound and into the substratum down to the soil-water level from one to five or six feet below the surface. (Holmquist 1928). In most cases the mounds are free from living vegetation. The smaller mounds are round to oval at the base and bluntly conical in shape. The larger mounds are in general somewhat elongated and consequently show a definite orientation in that the long axis is east and west. In addition, the south face has a longer more gentle slope with considerably greater surface area (sometimes double that of the north slope) than the shorter, steeper north slope. Among the 435 mounds tabulated, sixteen are dead or inactive colonies. In these cases the mounds possess a weather-beaten appearance. The surface layer is not so evident, and vegetation has begun to invade the soil of the mound.

---

[1] At the present time the Sag canal is used for drainage.

In the enumeration and mapping of the mounds it was observed that their distribution in the area is definitely limited. The majority, 48.7%, are located along the margin of the forest where it is traversed by open lanes or where it adjoins open meadow to the east, north, west, and southwest. This number includes mounds of all sizes, classified as small, medium, and large, although the two latter classes predominate. A small percentage, 17%, nearly all of the small type, are located in the open, i. e. 10 to 40 yards from the forest margin. The remainder, 34.3%, invariably occur in small open clearings in the interior of the forest. As in the case of the marginal nests the medium and large sizes predominate. The following table gives the complete

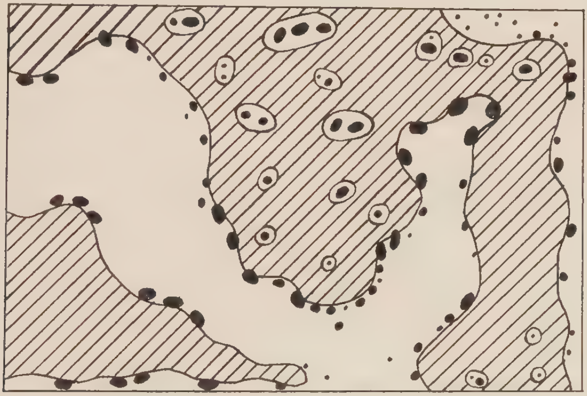


Fig. 1. Sample of typical distribution of *Formica ulkei* mound nests. Small, medium, and large mounds are indicated by the size of the black dots. The forested area is ruled with parallel lines. Clearings are shown by the circles around the dots in the interior of the forest. Scale is ½ inch = 25 yards.

classification of the mounds as to size[1], and distribution on the margin, open, or in a clearing. The accompanying figure, showing a typical portion of the map on which all the mounds are located, clearly illustrates this sort of distribution.

	Margin	Open	Clearing	Total
Small[1]	54	56	33	143
Medium	74	11	48	133
Large	84	7	68	159
Total	212	74	149	435
Per cent	48.7%	17.%	34.3%	100.%

Relation of Mound Distribution to Certain Environmental Factors

In addition to mapping and classifying the mounds of this particular region, some attention was directed towards the status of the local environmental factors in order to detect any correlation between the particular conditions and the distribution of these nests. Inspection shows a relation between the nest distribution and light since all colonies are situated to receive direct sunlight for the greater part of the day. Also, the mounds themselves are so constructed that the maximal surface area is exposed to the sun rays while the perpetually shaded north side of the mound becomes, in many instances, a steep slope from the apex of the nest to the ground. This suggestion of light as a factor is further substantiated by the fact that wherever nests appear within the forest, rather than along the margins, they are located within an actual clearing, which permits practically the same amount of light to fall upon the mounds as does on the marginally located nests and those of the open territory. Using the Macbeth Illuminometer, the intensity of the light was measured in foot-candles, to ascertain if the margins and clearings, where mounds are found, are actually receiving more light than the shaded forest floor. This is summarized in the second table.

---

[1] Small mounds are those 6 inches to 1 1-2 feet in diameter; medium mounds, 1 1-2 to 3 feet in diameter; large mounds, 3 to 5 feet in diameter.

Test-location	Date	Time	Foot-candles
Open margin	8-21-31	9:45 A. M.	2400
Open margin	8-26-31	9:45 A. M.	1750
Forest clearing	8-21-31	9:55 A. M.	2260
Forest clearing	8-26-31	9:55 A. M.	1665
Shaded forest	8-21-31	10:05 A. M.	44
Shaded forest	8-26-31	10:05 A. M.	18

The data of the table indicate that both margins and forest clearings are receiving essentially similar sun-radiations, while the shaded forest floor receives very low foot-candle intensities. There is no difference between the open meadow and the open margin of the forest. Relating these data to the fact that active nests are abundantly found along the open forest margins, in the open, or in clearings and are not located in the shaded forest areas, the conclusion is suggested that light intensity plays a definitely positive role in that a certain range of light intensity, i. e. of unobstructed sun, is favorable to mound building.

Such a distribution of the nests with respect to light in the visible range, also connotes a correlation between nest location and temperature; the latter being, in part, an expression of sunlight. The relation of temperature to mound nests of *Formica exsectoides* which are essentially similar to those of *Formica ulkei* has been treated by Andrews (1927). This investigator found that the temperatures of the upper part of the mound were higher than those of the lower part, and that these internal temperatures vary daily being due to heat received from the sun. These observations are in accord with our own. Andrews (1926) has also noted that *Formica exsectoides* nests increase in sunny regions and decrease in shaded areas; a further indication of the role of sunlight and temperature in connection with ant mound distribution.

The effect of soil moisture content on the nest distribution becomes a limiting factor only in the region of the marshlands which exist in some of the lanes between the forested areas. Here the surrounding substratum, for some thirty feet about its center, is too moist to permit nest building. Apparently the greater soil moisture of the lower land confines the nest building to the narrow strip along the forest margin. It thus exerts a negative or phohibitive influence which prevents the further spread of the mounds into the open where similar sunlight intensity prevails. It may be further noted in this connection that the greater number of mounds in the open are of the small type, the galleries of which do not extend far below the surface of the ground. Inspection shows soil conditions, other than moisture, to be quite similar in various parts of the area. There has been little erosion or deposition and the morainal drift is uniform in character. The ants build mounds and subterranean galleries with facility in both the loose surface soil and the hard clay below.

The relation between the presence of a colony and damage to surrounding vegetation has not been studied but a possible correlation is suggested in the well developed clearing surrounding all colonies in the interior of the forest. Andrews (1928) reports damage of mound building ants to vegetation. In this instance, however, consideration of the light conditions and the complete absence of either mounds or clearings in the denser parts of the forest indicate that the clearing is a cause rather than an effect of mound presence.

An interesting aspect of the problem not yet investigated, is the extent to which *Formica ulkei* modify the fauna of the region, or the extent to which certain species are absent or present here in comparison to similar areas not so populated by these ant colonies. Finally, observations on the unequal activity of mounds of the various sizes recorded indicate the need for careful analysis of the relations between size, age, and population of ant mounds. Such an analysis depends on subsequent periodic observations of these mounds, announcement of which will be made when their significance becomes apparent.

Summary

1. A survey of Palos Park, Illinois region records the presence of 435 mound-nests of *Formica ulkei* Emery in an area one quarter mile square.

2. Measurement of light intensity with the Macbeth Il-

luminometer shows an average of 2047 foot candles on the open margin and 1963 foot candles in the forest clearing as opposed to 31 foot candles on the shaded forest floor.

3. The distribution of the mounds is directly correlated with light intensity and attendant temperature conditions. Apparently a certan range of light intensity is a positively limiting factor in the location of these ant mounds.

4. Soil moisture limits the distribution of the mounds in such a way that it is considered in the role of a negatively limiting factor.

5. Several other interesting aspects of the complete ecological analysis of this unusual group of ant mounds are suggested for further study.

LITERATURE CITED

Andrews, E. A. 1926. Sequential distribution of *Formica exsectoides* F. Psyche, xxxii, pp. 127-150.

——————— 1927. Ant-mounds as to temperature and sunshine. Journal of Morphology and Physiology, xliv, pp. 1-21.

——————— 1928. Injuries to vegetation by mound-building ants. American Naturalist, lxii, pp. 63-75.

Cowles, H. C. 1901. The plant societies of Chicago and vicinity. Bull. Geog. Soc. Chicago; also Botanical Gazette, xxxi.

Dreyer, W. A. 1932. The effect of hibernation and seasonal variation of temperature on the respiratory exchange of *Formica ulkei* Emery. Physiological Zoölogy, v, No. 2, pp. 301-331.

Holmquist, A. M. 1928. Notes on the life-history and habits of the mound-building ant, *Formica ulkei* Emery. Ecology, ix, No. 1, pp. 70-87.

Park, Orlando 1929. Ecological observations upon the myrmecocoles of *Formica ulkei* Emery, especially *Leptinus testaceus* Mueller. Psyche, xxxvi, No. 3, pp. 195-215.

Park, Thomas 1929. Notes on the relationship between *Formica ulkei* Emery and *Solenopsis molesta* Say. Entomological News, xl, No. 10, pp. 325-326.

PHORIDÆ ASSOCIATED WITH ANTS AND TERMITES IN TRINIDAD[1]

By Charles T. Brues

The following notes and descriptions of Phoridæ are based on a small collection secured by Dr. J. G. Myers in Trinidad, British West Indies. As Dr. Myers intends to publish observations which he has made on the biology of the several species, I am taking this opportunity to present descriptions of two forms not previously known, together with notes that extend the known distribution of two other species.

Diploneura *(Dohrniphora)* **conspicua** Borgmeier

Vozes de Petropolis, vol. 17, p. 628 (1923)

Arch. Mus. Nac. Rio Janeiro, vol. 25, p. 99 (1925)

Two males, taken by Dr. Myers in Trinidad in company with the following species. The species was described as termitophilous by Borgmeier as his types were taken in a nest of Eutermes in Minas Geraes, Brazil.

This species resembles the North American *D. incisuralis* for which I mistook it at first glance, but the bristles outside the seam on the hind tibia lie much nearer to the hairseam.

Diploneura *(Dohrniphora)* **myersi** sp. nov.

♀. Length 1.6 mm. Body black; antennæ dark brown; palpi somewhat lighter brown; proboscis honey-yellow; legs dull brownish yellow, their coxæ almost black, except the front ones which are brownish; wings hyaline, with piceous venation. Front shining, slightly higher than broad; supra-antennal bristles inserted close together, strongly diver-

---

[1] (From the Entomological Laboratory, Harvard University)

gent; lower row of bristles (antial and first lateral bristles) forming a row strongly curved downward medially, the median ones twice as far from one another as from the lateral bristle; middle row nearly straight and equidistant; ocellar tubercle scarcely evident. Cheeks with a bristle at the lower angle of the eye and one below at the oral margin. Antennæ small, oval; arista pubescent. Palpi moderate, each with five bristles at apex. Proboscis rod-like, as long as the head height beyond the basal bend. Eyes uniformly pubescent, postocular cilia rather short. Mesonotum shining; scutellum twice as wide as long, with a pair of bristles at each side, the anterior one much smaller and almost hair like. Hairs of mesopleura reduced to a small group near the spiracle; one large macrochæta on the propleura below the spiracle. Abdomen with five chitinized tergites, the second lengthened and without bristly hairs at the sides; fifth more or less subtriangular or narrowly trapezoidal; following segments membranous. Front tibia with a series of four bristles on the fore side, one at the basal fourth, one at middle, one at apical fourth and one just beyond. Middle tibia with a pair of bristles externally near base and a hair-seam extending to the middle, beyond which is an area of six imbricated transverse rows of minute bristles. Hind tibia with a complete dorsal hair-seam and a row of bristles just next to it inwardly. Costal vein extending slightly beyond the middle of the wing; costal divisions 25:7.5:3, the first therefore nearly two and one half times longer than the other two together; costal cilia very short and closely placed; first vein distinctly thickened beyond the middle and the third from near the middle; second vein leaving the third at a very acute angle so that the cell formed is more than twice as long as wide on the costa with the veins bounding its sides very thin; one small bristle on the third vein at its base; fourth vein originating at the base of the second, gently curved at base and nearly straight beyond; seventh vein weak, but clearly defined. Halteres black.

Type: Trinidad, B. W. I., November 25, 1928; one specimen taken by Dr. J. G. Myers, hovering over a termitarium of Eutermes during a raid made by ants on the termites.

It would seem probable that the species is termitophilous as such is known to be the case among some other species of the genus.

In spite of the numerous species, several of which are termitophilous, that have been described from the American tropics, this species is undoubtedly undescribed. From several forms that are similar, it is distinguished as follows: from *D. knabi* Malloch by the shorter first section of the costa which is 2½ times as long as the other together, instead of 5 times, and by the nearly straight middle transverse row of frontal bristles; from *D. obscuriventris* Borgm. by its entirely black color; from *D. intrusa* Borgm. by the presence of 5 abdominal tergites and the black halteres (although there is a disagreement here between the original description and a subsequent key to species) ; from *D. anterodorsalis* Schm. by the longer first section of the costa.

Megaselia juli Brues

Three specimens collected in the act of attacking and ovipositing in a large millipede and one later reared from the same host; Trinidad, Dec. 19, 1928 and Jan. 4, 1929.

These specimens seem to be indistinguishable from the North American *Megaselia (Aphiochæta) juli* Brues in spite of the widely separated localities. A South American species, *M. mucronata* Borgmeier from Petropolis near Rio de Janiero is very similar, but differs in its much longer ovipositor and more nearly equal first and second constal divisions in the wing.

The ovipositor shows the same striation on both the apical and basal sections as Borgmeier has described and figured for *M. mucronata* (Arch. Mus. Nac. Rio de Janeiro, vol. 35, 142 (1925).

In both *M. juli* and *M. mucronata* the mesopleura has one strong macrochæta in addition to minute hairs. An European species *M. styloprocta* Schmitz has the body black and the mesopleural hairs all minute, although otherwise very similar.

Cremersia Schmitz

There is a species of this peculiar genus in the collection.

The female possesses a most remarkable asymetrical ovipositor that shows such striking similarity to the hypopygium of the males of certain other Diptera that specimens of this sex were first mistaken for males. Borgmeier has, however, more recently found the male (Arch. Biol. São Paulo, vol. 1, 1928) and thus shown conclusively that this organ is in fact an ovipositor of very unique type.

Cremersia minor sp. nov.

♀. Length 1.4 mm., including ovipositor. Black or piceous, lighter on the mesonotum, pleuræ and legs. Front, abdomen above and ovipositor black; antennæ and mesonotum fuscous; palpi and legs testaceous, the pleuræ considerably stained with brown; halteres piceous, with paler stalk. Wings hyaline, heavy veins piceous, light ones strongly colored, but very delicate. Lowest pair of frontal bristles separated by one-fourth the width of the front, stout and but little divergent; second row of two large bristles set very close to the eyes; third row of four equidistant, curved downward medially, placed high on the front, with the lateral bristles but little below the level of the lower ocellus. Antennæ small, bluntly oval, the arista short, stout and scarcely pubescent. Palpi very small, with four weak bristles at the tip; cheeks each with two rather strong bristles below the lower corner of the eye. Mesonotum long and narrow, with one pair of small dorsocentral bristles placed close to the hind margin; surface clothed with conspicuous fine hairs, and side margins with several conspicuous bristles just before the base of the wing as well as a large one on the scapula. Scutellum about semi-circular, with one pair of very short bristles and an extremely minute bristle in front of each of these. Propleura with two bristles next to the spiracle and another near the insertion of the fore coxa. Mesopleuræ entirely bare. Second segment of abdomen lengthened, the three following subequal, not greatly narrowed. Fourth tergite with a subapical series of delicate bristles, growing stronger laterally; fifth tergite on the margin with a series of four large bristles on each side and a series of about four small, delicate ones between. Sixth tergite much narrower than the fifth, convex and rounded at apex, with two cross rows each of five long, curved bristles, the anterior row on the right side and medially somewhat overlapping the posterior row (which is on the left side) as the anterior row extends well to the left of the median line; all these bristles curved toward the righthand side. Fifth sternite with a close series of about six stout bristles. Legs long and slender; front tarsi not modified in any way. Front tarsi with the first joint almost as long as the tibia; second and fifth joints each half as long as the first; fourth one-fourth shorter. Hind tibia with a dorsal hair-seam and a series of very minute setulæ just internal to this, these setulæ not much larger than the hairs that clothe the inner surface of the tibia; tibia at apex with one small bristle inside the seam; hind femur simple, without long hairs below. Ovipositor of the usual hypopygium-like form; shining black in color with a long finger-like process above that curves to the left and is provided near its base with two transverse bristle-like spines that extend horizontally to the left; below with a short process apically, terminating in a twisted hook. Wing similar to that figured by Borgmeier for *C. pilosa.* Costal vein extending to slightly beyond the basal third of the wing its bristles long; first section more than twice as long as the second and third together; third not quite half as long as the second; fourth vein entering the margin at tip of the wing; fifth lying very close to the fourth.

One female collected by Dr. J. G. Myers in Trinidad, B. W. I., November 25, 1928, "hovering constantly close over the backs of ants engaged in raiding a termitarium (Eutermes)." So far as is known the numerous South American species of this genus are ecitophiles.

In Borgmeier's key to the Brazilian species of this genus (Arch. Inst. Biol., São Paulo, vol. 1, p. 161, 1928) this species will run to *C. brasiliensis* from which it differs in the bristling of the terminal abdominal segments, especially in the very stout, straight bristles on the sixth sternite. It is also a much smaller species.

NOTES ON SOME TROPICAL PHORIDÆ[1]

BY CHARLES T. BRUES

The following notes and descriptions are based on material contained in several small collections of Phoridæ received for identification from correspondents.

Diploneura Lioy

Diploneura *(Diploneura)* **scoparia** sp. nov.

♂. Length 2.5 mm. Thorax and most of abdomen yellowish brown; head and abdominal markings black; wings tinged with brown and distinctly infuscated apically. Antennæ brown, palpi reddish yellow; pleuræ and legs brownish yellow, the hind femora tipped with black; scutellum piceous; abdomen above rather bright yellow with a lateral spot on the second to sixth tergites; these increase in width behind. Those on the second small and those on the sixth are nearly coalescent; posterior borders of the tergites yellow; hypopygium black; wing veins very dark brown, the infuscated area of the wing including the apical fourth and most of the cell anterior to the fourth vein. Front as high as broad, its bristles all very large and strong; two postantennal bristles, inserted very close together and widely divergent; lowest row of four equidistant, the middle ones placed distinctly lower than the lateral ones which are almost as far from the eye margin as from the inner bristles; upper frontal row of four equidistant, curved upwards medially with the lateral one close to the eye. Ocelli large, the occipital ridge sharp, but not elevated; postocular cilia very strong; cheeks each with two conspicuous, downwardly directed bristles, also a smaller bristle inside the eye-margin just below the antenna. Palpi stout, broadened

---

[1] (From the Entomological Laboratory, Harvard University).

apically, each with an irregular row of six or seven short, stout bristles at the tip. Antennæ small, oval; the arista longer than the head-height, with very short pubescence. Mesonotum finely pubescent, with one pair of dorsocentral macrochætæ and some strong bristles along the lateral margins. Propleura with two large bristles (one above the other) below the spiracle; also a fan-shaped series of four or five above the base of the coxa, the anterior one large and the others rapidly becoming smaller. Mesopleura entirely bare. Front tibia with a large bristle externally just before the middle and a series of about seven on the apical half, the latter small but clearly bristles and not strong hairs. Middle tibia with a pair of strong bristles externally at the base and two hair-seams with a groove between which bears a scattering row of hairs; the inner hair-seam is complete, but the outer one extends only to a little beyond the middle; beyond this there are several oblique rows of comb-like bristles and a series of small bristles that lie near the hair-seam and form the apical part of the row of hairs in the groove. Hind tibiæ with two complete, strong hair-seams on the dorsal edge, connected by eight strongly oblique rows of strong comb-like bristles; in addition with a series of scattering bristly hairs in the groove between the seams, these not very easily noticed on account of the conspicuous oblique rows of bristles that extend across them. Scutellum with four equally strong bristles. Sides of second segment of abdomen bare; third to fifth tergites subequal in length; sixth twice as long. Costa extending nearly to the middle of the wing, its bristles fine and closely placed; first section four and one-half times as long as the other two together since the first, second and third veins enter the costa very close together, the second almost midway between the first and third; fourth vein lying unusually near the costal margin, gently arcuate and strongly recurved at the tip; fifth and sixth veins very little curved; seventh strong. Halteres pale brownish yellow.

Female. Resembles the male, except that the four tergites of the abdomen are entirely yellow. The third and fourth are small and no fifth one is visible.

One specimen of each sex; male from Sydney, New South

Wales (H. J. Carter) and the female from Brisbane, Queensland (A. J. Turner).

This species does not fit very well into any of the subgenera adopted by Schmitz. The armature of the hind tibia consists really of two distinct hair-seams, but the space between these bears the numerous oblique comb-like rows of bristles as described above. This condition might also arise from the presence of three hair-seams in which the middle one became broken up into a number of separated oblique groups. As the species does not resemble the only one of the two species of which I have specimens that are placed in the subgenus Tristœchia and as it does resemble a certain one placed in Diploneura s. str. I have placed it there. Another striking character is the extremely short second section of the costa.

Syneura Brues

Syneura cocciphila Coquillett

This species appears to be widely distributed in the warmer parts of America. I have recently seen specimens sent by Dr. M. D. Leonard reared from *Icerya purchasi* at San Juan, Porto Rico, and there are also in my collection others reared from Icerya in Arizona. Several South American species have been described by Borgmeier, one of which is I think without doubt the same as *S. cocciphila.* This is *S. infraposita* Borgm. (Deutsch Ver. f. Wissensch. u. Kunst in São Paulo, Jahrg 3, p. 133 1922, (1923) and Arch. Mus. Nac. Rio de Janeiro, vol. 25, p. 227 (1925). The very complete descriptions given by Borgmeier agree closely with a single cotype specimen and the above mentioned examples reared from Icerya. Unfortunately the old descriptions of Coquillett and myself omit certain of the characters more recently used in classification and no complete description was available to Borgmeier. This is the only one of the neotropical species with the mesopleura hairy above.

Homalophora Borgmeier

Vozes de Petropolis, vol. 17, p. 849 (1923).

Deutsch Ver. Wiss. u. Kunst, São Paulo, Jahrg 3, p. 177 (1923).

This genus is based upon a single South American species, *H. reichenspergeri* described in the publications mentioned above which has been found living with the termite, Conitermes.

Several years ago I received through Mr. S. W. Bromley two wingless phorids which he had taken in a nest of the large Cuban leafcutting ant, *Atta insularis* Guér. at Santiago de las Vegas near Havana. These are undoubtedly referable to Homalophora, although they represent a distinct species from the termitophilous form. The apterous female of Homalophora resembles the two widespread genera, Puliciphora and Chonocephalus, but is readily distinguishable from the former by the absence of a curved slit in the fifth abdominal tergite, and from the latter by the presence of ocelli.

Homalophora cubensis sp. nov.

♀. Length 1.1 mm. Dark brown, the antennæ, mouthparts, thorax, legs and membranous parts of the abdomen testaceous. Front somewhat longer than broad; four nearly equal, erect and laterally divergent post-antennal bristles, the upper pair much farther apart than the lower ones. Occipital row as in *H. reichenspergeri.* Ocelli very small and forming a small triangle, the posterior ones very close to the two ocellar bristles which are set between them. Mesonotum twice as wide as long; with a strong backwardly directed bristle near, but clearly inside of the lateral margin just behind the middle; near the posterior margin with four bristles, each inner one twice as far from the other as from the adjacent lateral bristle, which in turn is twice as far from the lateral margin as from the adjacent inner bristle; these bristles of equal size, or with the lateral ones somewhat stronger. Six abdominal tergites, clothed with sparse, minute hairs, but without stout hairs or bristles along the hind margins; first half as long as the mesonotum; second tergite twice as broad as long, nearly twice as long as the thorax; third but little narrower than the second, but not much more than half as long; fourth narrower but nearly as long as the third, a little more than twice as wide as long, fifth smaller, twice as wide as long, half as wide as the second, without a slit, but with a slight transverse impression at the base; sixth very small. Abdomen slightly, but not greatly flattened, the membranous segments (1-6) visible at the sides, slightly on second, but broadly behind, with scattered hairs set in minute black spots; anal tube very pale and soft. Eye in lateral view about half as high as the head. Antenna smaller than the eye, with strongly pubescent arista; palpi small, with several long, but delicate bristles, directed mainly laterally. Proboscis as long as the head, rather thick and not heavily chitinized. Legs rather stout, of the usual form.

Described from two females from a nest of *Atta insularis* Guér. at Santiago de las Vegas, Havana, Cuba (S. W. Bromley).

This species differs from *H. reichenspergeri* Borgm. by the brown, not black, abdominal tergites and comparatively larger second tergite; also the outer bristle on the hind margin of the mesonotum is not weaker than the inner one. Since the size of the abdomen varies, the greater extension of the membrane cannot be regarded as a specific character.

Ptochomyia Silvestri

Boll. Zool. Gen. Agr., Portici, vol. 14, p. 272 (1920).

Ibid., l. c., p. 275 (1920).

This most remarkable form was described from Camerun, Nigeria and French Guinea where it lives in the nests of Ancistrotermes. I have a single female specimen sent to me some time ago by Dr. Alfred Emerson, who received it with the termites of the American Museum Congo Expedition, 1909-1915. It was collected at Niangara, Belgian Congo, May 20, 1913 by Herbert Lang, in a nest of *Macrotermes (Bellicositermes) natalensis* Haviland.

Ptychomyia is clearly related to Termitoxenia and Termitomyia, especially the latter, differing in the form of the proboscis in which the labium is greatly enlarged and swollen. The present specimen agrees closely with Silvestri's description and figures although the abdominal bristles are much weaker than they are shown in his figures. However, in the description these are referred to as "*setis minimis*" which suggests that their size may have become accentuated in the reproduction of the drawings. Otherwise I cannot find any striking differences as the form of the head, which serves to distinguish three varieties, falls within the range figured by Silvestri. The mesothorax is considerably wider than long, whereas in *P. afra* it is described as about equal in these two dimensions; one of Silvestri's figures (Fig. III, 1), however, shows it as more elongate.

The acquisition of further specimens may perhaps show that the present specimen really represents a second species as the host termite belongs to another genus.

NOTE ON *HAPLODICTYUS INCERTUS* NAVAS

By F. M. Carpenter

Museum of Comparative Zoology, Harvard University

In 1926 Navas published a description of a Mecopteron, *Haplodictyus incertus,* belonging to the family Bittacidae.[1] Following the description he gives the type locality as "Wilmerding Pa. A. Heine", and then adds, "Wahrscheinlich aus Africa". The similarity of the locality mentioned to Wilmington, Pa. (Pennsylvania) leads to doubtful suspicions, especially since Navas himself was apparently not quite certain that the place referred to was in Africa; and an examination of his figures of the genitalia and fore wings shows that *incertus* is in fact *Bittacus apicalis* Hagen, which inhabits the eastern part of the United States, from Georgia to New York. Inasmuch as the genitalia and wing markings of this species are very distinctive (cf. the figures in my revision, Bull. Mus. Comp. Zool., *70,* 1931), there can be no doubt that *incertus* is a synonym. The fact that Navas placed *apicalis,* a perfectly typical Bittacus, in the genus Haplodictyus Navas substantiates Esben-Petersen's contention (Selys coll., Monograph Mecoptera, 1921) that Haplodictyus is only a synonym of Bittacus.

---

[1] Trichoptera, Megaloptera and Neuroptera aus dem Deutsch. Entomolog. Institut. (Berlin-Dahlem). 2nd ser. Ent. Mitteil., *15*(1): 57-63. 1926.

THE EFFECT OF TEMPERATURE AND RELATIVE HUMIDITY UPON THE OLFACTORY RESPONSES OF BLOWFLIES

By Cyril E. Abbott

Morgan Park, Ill.

Introduction

It appears that almost no effort has been made to determine the possible conditioning of insect olfaction by other external factors. This may be due to the fact that studies in the relation of these factors to insect metabolism are comparatively recent. In 1917 Headlee discovered that atmospheric moisture, through its relation to the water optimum of the insect body, directly affects development. In the same year Hamilton found that above 20° C soil insects are especially sensitive to evaporation. Shelford (1913) observed that insects resisted drying more effectively that most other animals. Beattie (1928) has made some interesting experiments with *Calliphora erythrocephala*. She finds that a relative humidity of 70 is optimum for the species, and that saturated or dry air lowers the thermal death point. Miller (1930) finds that at 37.5° C the percentage of surviving adult Mexican bean beetles, irrespective of humidity, is high. At 42.5° C the percentage is low at all humidities, while at temperatures between the extremes, the greatest percent of survival is at a relative humidity of 73. Marchand (1920) observes that *Blatta, Chionea* and various species of mosquitoes orient to heat. According to Herter (1923) *Formica rufa* distinguishes temperature changes as low as ¼° C. Miller and Gan were able to make *Cremastogaster lineolata* orient to radiant heat. Lodge (1918) finds that *Musca domestica* has its feeding reactions affected by changes in temperature and humidity.

The following study was suggested by Kennedy's (1927) statement that the olfactory powers of certain Hymenoptera appear to vary with relative humidity. Under normal conditions, adults of *Lucilia sericata* Meig. react to ethyl butyrate by an extension of the proboscis and regurgitation of fluid (Fig. 1). This is a definite feeding response to olfactory stimulation. The problem was to determine to what extent this response is dependent upon temperature and relative humidity.

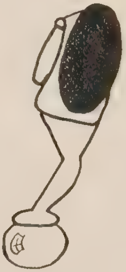


Fig. 1. Extension of proboscis and regurgitation by *Lucilia sericata*.

Materials and Methods

Adult flies were kept in small cages and fed a solution of cane sugar and what juices they could obtain from hog's liver. The latter was replaced every alternate day, and any eggs removed to flower pots about two-thirds full of sand. These containers were covered with muslin. The maggots pupated in the sand and as soon as adult flies began to emerge in a given container, the latter was transferred to one of the cages.

Flies were tested individually and discarded after each test. The insect was placed in a chamber consisting of a test tube fitted with a rubber stopper having two inlet tubes. During the test, this tube was kept in a constant temperature bath composed of an aquarium fitted with two Lolag heaters, a thermostat, a stirring device, and two U-tubes which served to equalize the temperature of the air drawn into the fly chamber. One of these tubes was connected with the "check" apparatus; the other with the "test" apparatus. When properly adjusted, the temperature of the tank never varied more than 1/5° C. Each of the units used for the control of humidity consisted of two bottles arranged so that air was drawn through solutions they contained; in addition, the "test" set had a vessel containing ethyl butyrate shunted between these bottles and the U-tube. This vessel was held at a constant temperature of 30° C. in all tests.

Relative humidity was controlled by chemicals. A concentrated solution of a given compound gives the air with which it comes in contact a definite relative humidity. Four were used:

Chemical	Relative humidity
H_2O	98-100
NaCl	73
NaOH	30
N_2SO_4	0-4

The general method was to change the humidity, the temperature being constant. The tests at the four humidities were then repeated for another temperature. Three temperatures were used: 20° C., 30° C., and 40° C.

Flies were collected in the afternoon and were kept without food for five hours. They had free access to water. Sixty-four flies were used in each test. The method of procedure was as follows: a fly was secured on the end of a galvanized iron wire by wrapping its wings and the end of the wire with adhesive tape. The opposite end of the wire was fixed in the lower surface of the rubber stopper of the test chamber. This last, containing the stopper with the attached fly and tubes was placed in the constant temperature bath for one minute. One inlet tube was attached, by means of a rubber tube, to the "check" apparatus. The other inlet tube was similarly attached to a water-pump. The fly was observed for thirty seconds. If it did not respond (which was generally the case) the tube attached to the "check" apparatus was transferred to the "test" apparatus. Again the fly was observed for thirty seconds. If it extended the proboscis within this time, it was considered "positive." Sexes were used in about equal numbers. Percentage of response was based upon the number of insects giving a positive reaction at a definite temperature and humidity.

Results

The results of the foregoing tests are embodied in the following graph (Fig. 2). Neither at 20° C. nor at 40° C. was the percentage of response very high. The highest (57%) took place at 20° C. in a saturated atmosphere. At 30° C. there was a rise in percentage of response almost directly proportional to the increase in humidity, until the latter reached 73%, after which it fell slightly. At 30° C. and a humidity of 73% the percent of response was 89; at a humidity of 100% it was 76. There was no indication of sex differences in these responses. The fact that there were practically no responses to the "check" indicates that it was really the vapor of ethyl butyrate and not air currents that brought about the responses.

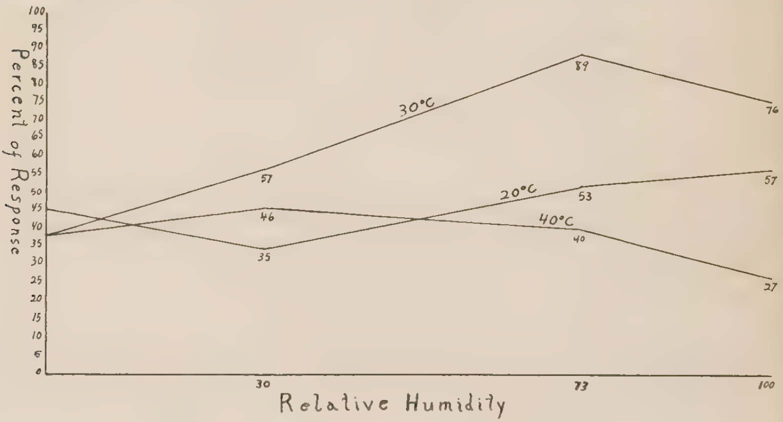


Fig. 2. Olfactory responses of blow-flies.

General Conclusions

Several months of breeding and general observations indicate that the most favorable temperature for the metabolism of *L. sericata* is about 30° C. In the light of this fact, the discrepancies between the behavior of flies tested at that temperature and those tested at other temperature ranges can be easily understood. Apparently it is only at the temperature of metabolic optimum that humidity has much effect on their olfactory responses. At that temperature, the optimum for humidity is 73%.

It is a pleasure to thank Dr. C. H. Kennedy, Dr. W. M. Barrows, and Dr. D. F. Miller for many suggestions, materials, and aid in carrying this problem to a successful conclusion.

LITERATURE CITED

Beattie, M. F. V. 1928. Bul. Ent. Research, *18,* 397-403

Hamilton, C. C. 1917. Biol. Bul., *32,* 159-177

Headlee, T. J. 1917. Jour. Econ. Ent., *10,* 31-38

Herter, K. 1923. Biol. Zentbl., *43,* 282-285

Kennedy, C. H. 1927. Ann. Ent. Soc. Amer., *20,* 87-106

Lodge, Olive C. 1918. Bul. Ent. Research, *9,* 141-151

Marchand, W. 1920. Ent. News, *31,* 159-161

Miller, D. F. and M. Gan 1926. Jour. Compar. Psychol.

Miller, D. F. 1930. Jour. Econ. Ent., *23,* 945-955

Shelford, V. E. 1913. Biol. Bul., *25,* 79-120

NOTES ON THE PREY AND INQUILINES OF *PODALONIA VIOLACEIPENNIS* FORM *LUCTUOSA* (F. SMITH)

By Charles H. Hicks,

University of Colorado, Boulder, Colorado

The digger wasp, *Podalonia violaceipennis* form *luctuosa* (F. Smith)[1], captures cutworm larvæ and stores them as food for her young. The prey is usually dug from the soil and paralyzed by stinging. Later, after a cell has been constructed, it is placed in the earth, an egg is attached to its side and it soon becomes food for the waspling.

The prey, large, mature or nearly mature cutworms, are found and overcome by the wasp but usually, not without some difficulty. The hunt and capture has been described by Newcomer[2], who also has given an account of the wasp's habits, and later by Hicks[3]. The larvae hide by day, concealed beneath the soil or some suitable object, and it is a task for the wasp to find them.

A study of the cutworms, taken by the wasp, shows that several species are involved. The wide geographical distribution of *P. luctuosa,* (found according to Fernald[2], "practically everywhere in the Northern United States and Southern Canadian territory"), would suggest this probability and the facts thus far bear it out. A consideration of certain data follows.

---

[1] Kindly determined by Professor H. T. Fernald.

[2] Newcomer, E. J. Notes on the Habits of a Digger Wasp and Its Inquiline Flies. Ann. Ent. Soc. Amer., 23: 552-563, 1930.

[3] Hicks, Charles H. The Hunt and Capture of the Prey of a Digger Wasp. Bull. So. Calif. Acad. Sci., 30: 75-83. 1931.

——————On the Digger Wasp, *Podalonia luctuosa* (F. Smith). Pan-Pacif. Ent. 8:49-51. 1931.

[4] Fernald, H. T. The Digger Wasps of North America of the Genus Podalonia (Psammophila). Proc. U. S. Natl. Mus., Vol. 71, pp. 1-42. 1927.

In Colorado, although no specific determinations were made, it was nevertheless evident from the diversity of structure and markings of the prey, that a number of species of moth larvae had been taken by the wasp. In California, a few species were reared to maturity or otherwise identified.

It appears almost impossible, under the present imperfect conditions, to rear to the imago the inert and stung prey, in order to learn the species of moth used. The cutworm, if the wasp egg be removed and if it contains no serious internal parasites, usually lives for a time, wastes away and finally dies. It seems possible that a suitable antidote might be prepared and injected into the prey to counteract the poison of the sting but as yet, to my knowledge at least, this has not been advanced nor perfected.

The prey has been taken away from nesting females, from time to time, preserved and studied. In this manner, many larvæ have been secured. To supplement this phase of the work, live, normal cutworms have been collected from the field, taken to the laboratory and reared to adults. These larvae have been found hiding beneath old boards, under rocks in the soil, or in the earth around the roots of plants. One reared specimen was *Lycophotia saucia* Hubn.[1] It was taken from a wild tobacco plant, *Nicotiana glauca* Graham, upon the leaves of which there was evidence of it having been feeding. This individual pupated February 1st and emerged mature February 23rd. Another species, determined from a larva sent to Carl Heinrich at Washington, is *Chorizagrotis agrestis* Grt., a prey of *P. luctuosa.* A moth, concerning which there remains some doubt as to whether or not its young is often used as prey, is *Lycophotia margaritosa* Haw.[2]

One group of wasp cells, dug and provisioned by a single mother over a period of time, numbered seven. They had been stored with moth larvæ, representing three undetermined species. These had been used in as nearly equal numbers as possible. The ratio here, as also found elsewhere, would seem to follow the law of chance and not be due to a definite selective action on the part of the huntress.

---

[1] Determined by Dr. John A. Comstock.

[2] Determined by Dr. H. G. Dyar.

The observed females of *P. luctuosa* have appeared to use, nevertheless, some selection in the individual cutworms chosen for their young. Whether this is a wise and consistent discrimination, or a chance and sporadic habit, it would be difficult to say.

The wasp rather frequently malaxates her prey after it has been stung to quietness. She pinches its neck and laps up the juices issuing from its mouth. This appears usually to be tasteful to her and may play a part in her life's economy. A rejected prey may or may not have been one previously malaxated. In one instance, at least, she stored a prey, which from malaxation was found to be highly distasteful to her, and that with no ill effects to her young.

The rejection of certain prey does not always seem to have been prompted by the small size of the victim, for often it is large and plump and in the matter of size the wasp is not exceedingly exact. She apparently never stores more than one cutworm to a nest but the particular cutworm may vary somewhat in actual dimensions. Although she exercises great freedom of choice, it is yet possible she does sometimes unearth one too small for her needs.

The wasp appears wholly unable to recognize a parasitized prey. This is shown by the fact that she not infrequently stores such a one for her young to eat. It then presents grave danger or dire disaster to her progeny. Two such prey were used in quick succession one afternoon by the same digger, the wasp larvae of which escaped seemingly only by a miracle. These nests were taken in my own backyard at Pasadena, California on April 30, 1928. The two nests were both provisioned in a total time of but little more than one hour.

Each larva, with an attached wasp egg, was obtained at once after the wasp had stored it in her nest. They were kept in a warm room where development was hastened and recorded. During the first day nothing unusual was noted but on the second a number of small larvae were found issuing from one. We will trace the subsequent history of each prey separately.

The small larvae were coming to the outside of the cutworm through holes made in its body wall. These punctures were formed rather generally over the body surface and consisted of seventeen in all. Fortunately, they were all some distance from the point where the wasp's egg had been attached. The larvae soon began spinning cocoons in the fine cotton on which the cutworm was resting. Two days later the last of these cocoons had been finished. These remained until May 11th when the adults began emerging. The insects were small ichneumonids, *Meteorus vulgaris* Cress.[1] which cut circular caps off the anterior ends ends of the cocoons in order to get out. The cocoons empty, their size and structure could more readily be noted. They were somewhat oblong in form, measured about 4.5 mm. in length and 2 mm. in width, through the center, and were light in color. Coarser strands of silk held the cocoon proper attached to the cotton threads. The anterior end possessed a distinct broad, blunt and thicker cap; the posterior end somewhat larger and more pointed, contained within the meconium or splotch of excrement, expelled from the larva after the cocoon had been formed.

The egg of the wasp, attached to the cutworm from which the larval ichneumonids emerged, hatched in due season, the larva began feeding and continued to eat the prey so long as any remained. The food exhausted, it soon spun a cocoon in which to pupate. On May 25th, an active female, *P. luctuosa,* cut away the end of the cocoon and crawled out. She was apparently normal in every respect, with the exception that she was smaller than the average. Thus the cutworm from the first nest had provided food for seventeen internal parasites and later furnished enough for the growth and development of the wasp in addition.

The cutworm from the second nest met a somewhat similar fate. Three days after capture by the wasp, eight fly magots squeezed their fat bodies through small holes in the cutworm's body. The wasp larva (the egg of which had already hatched in this instance) was not injured, although one fly larva came through the wall very near to it. Puparia were soon formed and the flies emerged on May 12th. Specimens were sent to Washington and have been determined as *Wagneria carbonaria* Panz.[1]

---

[1] Kindly determined by Mr. A. B. Gahan.

Again, the larva of *P. luctuosa* developed and formed a cocoon, emerging on the same day as the insect from the first nest. It, too, was a female of about the same size as the one from the other cell. Although each of these females were undersized, they were no smaller than some others found in the field capturing prey and provisioning nests and there is no reason to believe that these could not have done likewise had they developed in the soil or been released from the laboratory.

Newcomer, in the paper previously mentioned, gives the noctuid, *Euxoa testula Sm.*, as a possible prey of the wasp, the adults having been captured about his laboratory at a time when the cutworm should have reached maturity had similar ones been used earlier by the wasp. He lists three flies associated with the wasp. There are: *Hilarella hilarella* (Zett.), a species which deposits living young in the nest; *Taxigramma (Heteropterina) heteroneura* (Meig.), a species superficially resembling *Hilarella;* and *Metopia leucocephala* (Rossi).

Hilarella hilarella is a fly frequently met with at or near Los Angeles, depositing its larvae in the nest of this wasp and that of other nesting wasps. It was found quite common at Boulder, Colorado, in association with the wasp, *Sphex aberti* (Hald).[2]

---

[1] Determined by Dr. J. M. Aldrich.

[2] Determined by Dr. H. T. Fernald.

PSYCHE

INDEX TO VOL. XXXIX. 1932

INDEX TO AUTHORS.

Abbott, C. E. The Effect of Temperature and Relative Humidity upon the Olfactory Responses of Blowflies. 145.

Banks, N. Obituary—J. H. Emerton. 1.

Banks, N. Concerning the Genus Notiobiella (Neuropt.-Hemerobiidæ). 103.

Barber, H. S. *Dendroides canadensis* Latreille-Synonymy. 36.

Benjamin, F. H. On the So-called Introduction of *Heliothis dipsacea* L. into the United States. 58.

Bequaert, Jos. *Amblyomma dissimile* Koch, a Tick Indigenous to the United States (Acarina: Ixodidæ). 45.

Bill, J. P. Swarming Chironomidæ. 67.

Brues, C. T. Phoridæ Associated with Ants and Termites in Trinidad. 134.

Brues, C. T. Notes on Some Tropical Phoridæ. 139.

Carpenter, F. M. Note on *Haplodictyus incertus* Navas. 144.

Cole, A. C., Jr. The Thatching Ant, *Formica obscuripes* Forel. 30.

Creighton, Wm. S. A New Female of Acamatus from Texas. 73.

Crowell, M. F. Oviposition of the Ichneumonid *Itoplectis conquisitor* (Say) in a Larva of *Pyrausta nubilalis* Hubn. 102.

Dow, R. P. Biological Notes on Cuban Wasps and Their Parasites. 8.

Drake, C. J. Notes on Some American Tingitidæ (Hemiptera). 100.

Drake, C. J. and H. M. Harris. Some Miscellaneous Gerridæ in the Collection of the Museum of Comparative Zoology (Hemiptera). 107.

Dreyer, W. A. and T. Park. Local Distribution of *Formica ulkei* Mound-nests with Reference to Certain Ecological Factors. 127.

Dunn, L. H. An Effective Method for Collecting Ectoparasites from Live Animals and Birds. 26.

Fall, H. C. A New Species of Dicælus from Southern Florida. 19.

Fall, H. C. New Species of Cryptocephalus (Coleoptera; Chrysomelidæ). 21.

Gerry, B. I. A New Species of Chironomus from Jamaica (Chironomidæ). 69.

Hicks, C. H. Notes on the Prey and Inquilines of *Podalonia violaceipennis* form *luctuosa* (F. Smith). 150.

Jacot, A. P. Concerning Oudemans' "Kritisch historisch Overzicht der Acarologie" in its bearing on Nomenclature of the Moss-Mites. 59.

Johnson, C. W. A New Species of the Genus Mydas. 72.

Komp, W. H. W. A New Culex, *Culex vomerifer*, from Panama (Dipt., Culicidæ). 79.

Komp, W. H. W. and D. P. Curry. A New Culex from Panama. (Dipt., Culicidæ). 82.

Melander, A. L. The Entomological Publications of C. W. Johnson. 87.

Miller, F. W. Muscle Variations in the Tibia of Several Species of Aphids. 64.

Myers, J. G. Two Brief Historical Notes. 34.

O'Byrne, H. A Female Intermediate between *Papilio glaucus* and its form *turnus* (Lepid: Papilionidæ). 35.

O'Byrne, H. November Observations on *Pieris protodice vernalis* Edw. in Missouri (Lepid., Pieridæ). 85.

Pearson, E. O. Notes on the Genus Dysdercus (Hemiptera-Heteroptera) in Trinidad, B. W. I. 113.

Tulloch, G. S. A Gynergate of Myrmecia. 48.

Wheeler, W. M. An Australian Leptanilla. 53.

Wolcott, A. B. Two New Species of East African Cleridæ (Coleoptera). 41.

Woodworth, C. E. A Wireworm Double Monster (*Limonius canus* Lec., Elateridæ, Coleoptera). 37.

INDEX TO SUBJECTS.

All new genera, new species and new names are printed in SMALL CAPITAL LETTERS.

Acamatus schmitti, 78
Acarus geniculatus, 61
Acarus scaber, 59
Acroricnus cubensis, 11
A Gynergate of Myrmecia, 48
Amblyomma dissimile, 45
American Tingitidæ, 100
A Method for Collecting Ectoparasites, 26
Amphorophora cosmopolitania, 64
An Australian Leptanilla, 53
A New Culex from Panama, 79, 82
A New Species of Chironomus from Jamaica, 69
A New Species of the Genus Mydas, 72
Annandalia, 103
ANNANDALIA HAGENI, 105
Aphis feminea, 64
Aphis rumicis, 64
Aphis sambucifolii, 64
A Wireworm Double Monster, 37

Book Notice, 52
Brathinus varicornis, 51
Buxtonia, 103

Calliphora erythrocephala, 145
Chiracanthium inclusum, 10
CHIRONOMUS PSEUDOFASCIATA, 70
Chironomus varipennis, 69, 70
Chlorion (Ammobia) cubensis, 9
Chlorion (Ammobia) dubitatum, 8
Chorizagrotis agrestis, 151
Colopha ulmicola, 64
CORYTHUCHA DECEPTA, 100
CORYTHUCHA SAGILLATA, 101
Crematogaster lineolata, 145
Cremersia, 136
CREMERSIA MINOR, 137
CRYPTOCEPHALUS APICEDENS, 22
CRYPTOCEPHALUS CUNEATUS, 24
CRYPTOCEPHALUS MERUS, 23
CRYPTOCEPHALUS OCHRACEUS, 25
CRYPTOCEPHALUS PALLIDICINCTUS, 21
CULEX (UPSILOPORPA) HAYNEI, 82
CULEX VOMERIFER, 79

Dendroides canadensis, 36
DICAELUS DARLINGTONI, 19
Dicælus from Southern Florida, 19
Diploneura, 139
DIPLONEURA (DIPLONEURA) SCOPARIA, 139
Diploneura (Dohrniphora) conspicua, 134
DIPLONEURA (DOHRNIPHORA) MYERSI, 134
Distribution of *Formica ulkei*, 127
Drepanaphis acerifolii, 64
Dysdercus andreæ, 113
Dysdercus fernaldi, 123
Dysdercus howardi, 114
Dysdercus howardi var. *minor*, 113
Dysdercus maurus, 116
Dysdercus mimus, 119
Dysdercus ruficollis, 113

ECITON (ACAMATUS) WHEELERI SUBSP. DUBIA, 75
Entomological Publications of C. W. Johnson, 87

Epeira fuscovittata, 10
Epeira oazacensis, 10
Epeira prompta, 10
Eriosoma lanigerum, 64
Eurymus eurytheme, 85
Euxoa testula, 154

Female of Acamatus from Texas, 73
Formica exsectoides, 131
Formica obscuripes, 30
Formica rufa, 145
Formica ulkei, 127

Ganchetus, 103
Gerridæ in the Museum of Comp. Zoology, 107
Gerris buenoi, 108
Gerris cariniventris, 108
GERRIS CARMELUS, 108
Gerris chilensis, 108
Gerris dissortis, 107
Gerris incognitus, 107
Gerris marginatus, 109
Gerris nyctalis, 107
Gerris remigis, 107
GYPONYX HENTZI, 42
GYPONYX PERTENUIS, 41

Haplodictyus incertus, 144
Heliothis phloxiphagus, 58
Hilarella hilarella, 154
Homalophora, 144
HOMALOPHORA CUBENSIS, 142

Iguana rhinolopha, 46
Introduction of *Heliothis dipsacea*, 58
Itoplectis conquisitor, 102

Kallistometra taylori, 112

Leptanilla doderoi, 53
Leptanilla exigua, 53
Leptanilla, havilandi, 53
Leptanilla minuscula, 53
Leptanilla nana, 53
Leptanilla revelierei, 53
LEPTANILLA SWANI, 54
Leptanilla tanit, 53
Leptanilla tenuis, 53
Leptanilla theryi, 53
Leptanilla vaucheri, 53
LIMNOGONUS ADUNCUS, 110
Limnogonus guerini, 109
Limonius canus, 37
Lycophotia margaritosa, 151
Lycophotia saucia, 151

Macrosiphum granarium, 64
Megaselia juli, 136
Metopia leucocephala, 154
Metrobates cubanus, 111
Metrobates denticornis, 111
Metrobates tumidus, 111
Musca domestica, 145
Mydas bitæniatus, 72
MYDAS PERPOLITUS, 72
Myrmecia (*Promyrmecia*) *aberrans*, 48
Myzus persicæ, 64

Neoconocephalus maxillosus, 9
New Species of Cryptocephalus, 21
New Species of East African Cleridæ, 41
Nicotiana glauca, 151
Nomenclature of the Moss-Mites, 59
Notes on Cuban Wasps and Their Parasites, 8
Notiobiella, 103
NOTIOBIELLA PETERSENI, 106
Notiobiella stigmatica, 103
Notiobiella unita, 103
Notiobiella valida, 104
Notiobiella viridineris, 104

Obituary—J. H. Emerton, 1
Observations on *Pieris protodice*, 85
Oldest Work on Insect Anatomy, 34

Olfactory Responses of Blowflies, 145
Ovisposition of *Itoplectis conquisitor* in a Larva of *Pyrausta nubilalis*, 102

Pachodynerus nasidens, 12
Papilio glaucus, 35
Papilio glaucus and its form *turnus*, 35
Pelopœus lunatus, 11
Peucetia viridans, 10
Phoridæ Associated with Ants and Termites, 134
Pieris protodice, 85
Platygerris depressus, 111
Podalonia violaceipennis form *luctuosa*, 150
Polistes cubensis, 15
Polistes fuscatus var. *pallipes*, 16
Polistes incertus, 12
Polistes major, 14
Polistes poeyi, 14
Polistiphaga fulva, 16
Polistiphaga fulvescens, 16
Prey and Inquilines of *Podalonia violaceipennis* form *luctuosa*, 150
Ptochomyia, 143
Publications of C. W. Johnson, 87
Pyrausta nubilalis, 102
Sceliphron assimile, 10
Sceliphron cœmentarium, 10
Schizoneura americana, 64
Sistrurus miliaris, 45
Some American Tingitidæ, 100
Sphecius speciosus, 9
STIGMATIUM MUCRONATUM, 43
Swarming Chironomidæ, 68
Syneura, 141
Syneura cocciphila, 141

Taxigramma (*Heteropterina*) *heteroneura*, 154
Thatching Ant, *Formica obscuripes*, 30
Tibial Muscles of Aphids, 64
Trepabotopsis denticornis, 111
Trepobates pictus, 111
Trepobates taylori, 111
Trepobates trepidus, 111
Tropical Phoridæ, 139

Vaja, 103

Wagneria carbonaria, 154

Zooprophylaxis for Mosquitoes, 34

PIN-LABELS IN MULTIPLES OF 1000, ALIKE

One Dollar Per Thousand

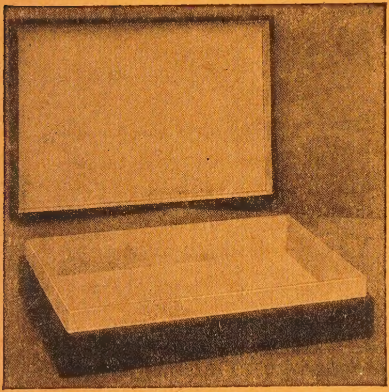
Smallest Type. Pure White Ledger Paper. Not over 4 Lines nor 30 Characters (13 to a line) Additional Characters, 3 cents each, in total and per line, per 1000. Trimmed so one cut makes a label.

C. V. BLACKBURN, 7 Emerson St., STONEHAM 80, MASS

CAMBRIDGE ENTOMOLOGICAL CLUB

A regular meeting of the Club is held on the second Tuesday of each month (July, August and September excepted) at 7.45 p. m. in Room C-455, Biological Institute of Harvard University, Divinity Ave., Cambridge. Entomologists visiting Boston are cordially invited to attend.

WARD'S NATURAL SCIENCE ESTABLISHMENT,
Incorporated,
P. O. Box 24, Beechwood Station, Rochester, N. Y.



We can now offer:

The Hood Insect Box, designed by Prof. J. Douglas Hood of the University of Rochester. This is a strong, tight box, measuring 12-3/4 x 8-3/4 x 2-3/4 inches, moderately priced, only $12.00 per dozen; single boxes, $1.25 each.

The Hood Insect Net, strongly constructed and dependable, with no soldered joints. The price of this, complete with Bruxelles bag and handle, is $1.60.

We also make the *only genuine Schmitt insect box* and the *American Entomological Co. insect pins.*

Write for catalogue No. 43 of Entomological Supplies.

THE FRANK A. WARD FOUNDATION
OF NATURAL SCIENCE
of the University of Rochester

COMPLETE SET OF PSYCHE

Volumes 1-38 (Bound) For Sale

Please communicate with Miss Parthenia J. Ford, 60 Gorham Avenue, Brookline, Mass. This is the set belonging to the late Mr. C. W. Johnson.

BACK VOLUMES OF PSYCHE

The Cambridge Entomological Club is able to offer for sale the following volumes of Psyche. Those not mentioned are entirely out of print.

Volumes 2, 3, 4, 5, 6, 7, 8, 9, 10; each covering a period of three years, $5.00 each.

Volumes 12, 14, 15, 17, each covering a single year, $1.00 each.

Volumes 18, 19, 20, 21, 22, 23, 24, 25, 26, each covering a single year, $1.50 each.

Volumes 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, each covering a single year, $2.00.

Orders for 2 or more volumes are subject to a discount of 10%.

Orders for 10 or more volumes subject to a discount of 20%.

A set of all the volumes available (34 in all) will be sold for $67.00.

All orders should be addressed to

F. M. CARPENTER, Associate Editor of Psyche,
Museum of Comparative Zoölogy,
Department of Entomology,
Cambridge, Mass.